# South Pacific bulletin



APRIL, 1964

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# SOUTH PACIFIC BULLETIN

VOL. 14, No. 2 APRIL, 1964

## CONTENTS



EDITOR: *C. E. Birchmeier*

# *The South Pacific Commission*

*The South Pacific Commission is an advisory and consultative body set up in 1947 by the six Governments then responsible for the administration of island territories in the South Pacific region (Australia, France, the Netherlands, New Zealand, the United Kingdom and the United States of America). Participation by the Netherlands Government ceased at the end of 1962.*

*The Commission's purpose is to advise the participating Governments on ways of improving the well-being of the people of the Pacific island territories. It is concerned with health, economic and social matters. Its headquarters are at Noumea, New Caledonia.*

*The Commission consists of not more than ten Commissioners, two from each Government. It normally holds one session each year. There are two auxiliary bodies, the Research Council and the South Pacific Conference.*

*There is a Research Council meeting normally once a year. This may be either a meeting of the full Council, or of one or other of its three main sections, specialising in the fields of health, economic development and social development. Members of the Research Council are appointed by the Commission. They are selected for their special knowledge of the questions with which the Commission is concerned, and the problems of the territories in these fields. The chief function of the Research Council is to advise the Commission on what investigations are necessary and on the work programme. Arrangements to carry out those that are approved are the responsibility of the Secretary-General and other principal officers.*

*The South Pacific Conference, which meets at intervals not exceeding three years, consists of delegates from the local inhabitants of the territories, who may be accompanied by advisers. The first Conference was held in Fiji in April, 1950. The second Conference was held at Commission headquarters in April, 1953, the third in Fiji in April-May, 1956, the fourth in New Britain in April-May, 1959, and the fifth in Pago Pago, American Samoa, in July, 1962.*

*The principal officers of the Commission are: Secretary-General, Mr. W. D. Forsyth; Executive Officer for Social Development, Dr. Richard Seddon; Executive Officer for Economic Development, Dr. Jacques Barrau; Executive Officer for Health, Dr. Guy Loison. The powers and functions of the Deputy Chairman, Research Council, are exercised by the Secretary-General.*

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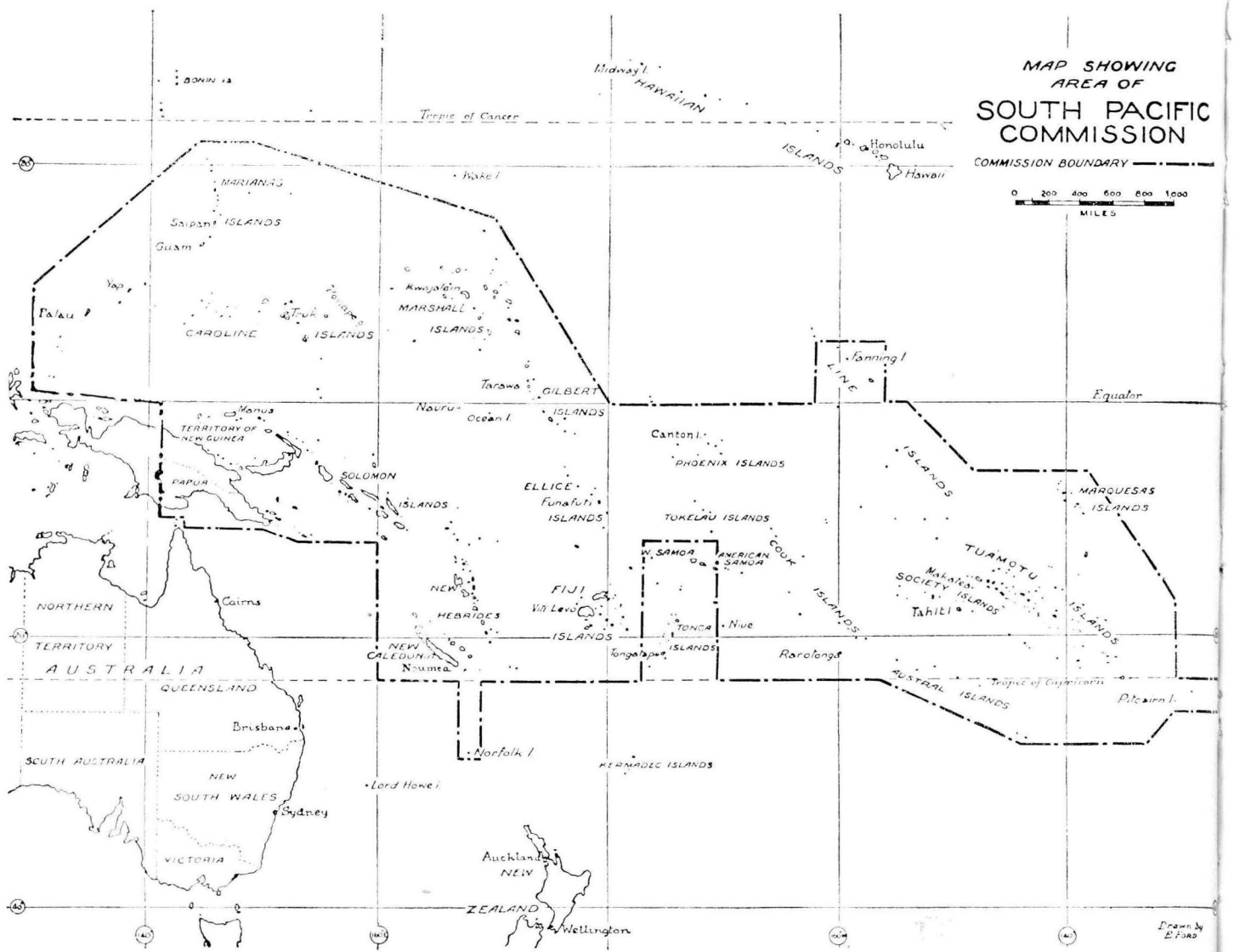
COVER PICTURE

The modern method of transporting sugar-cane in the canefields at Lambasa, Fiji. Picture by Reg Horner, Official Photographer of Qantas Empire Airways Ltd.

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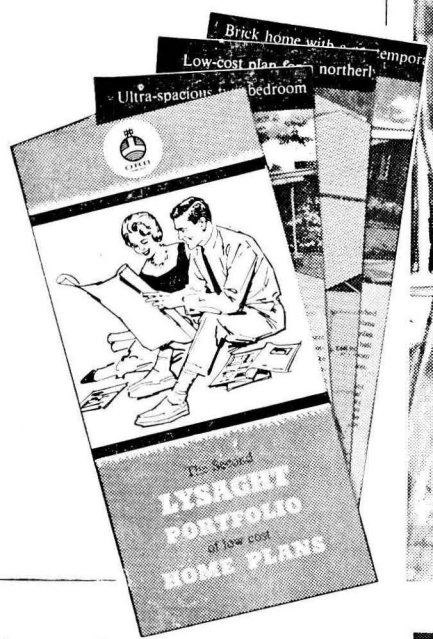


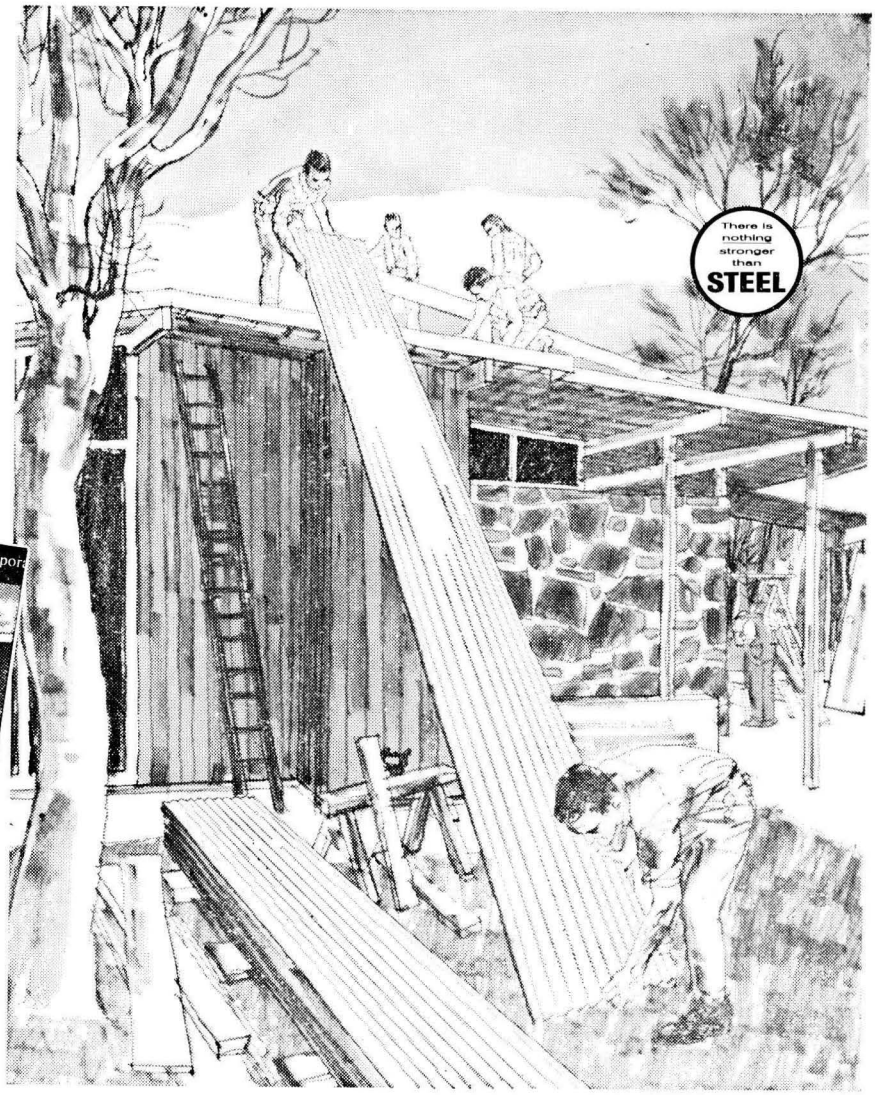


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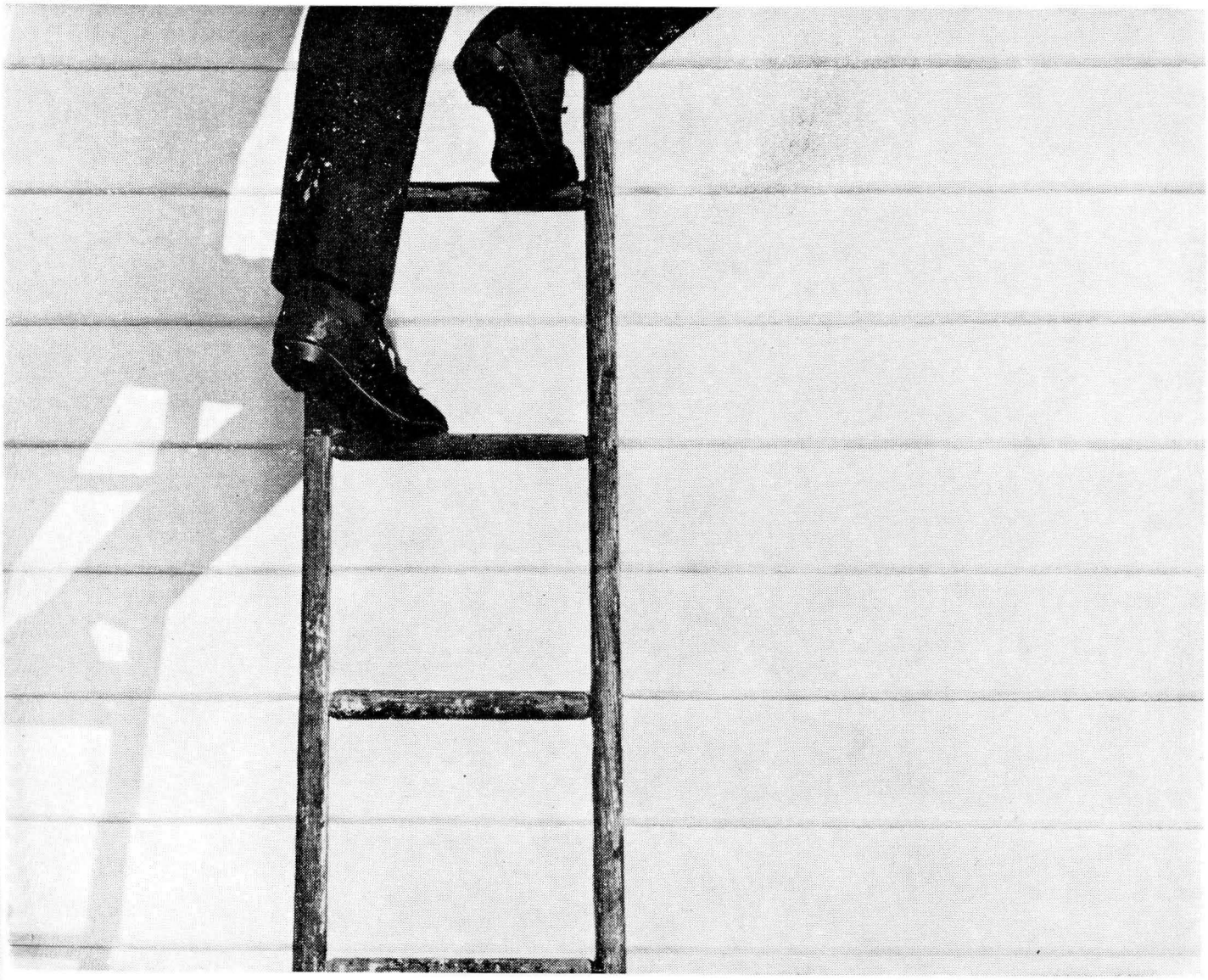

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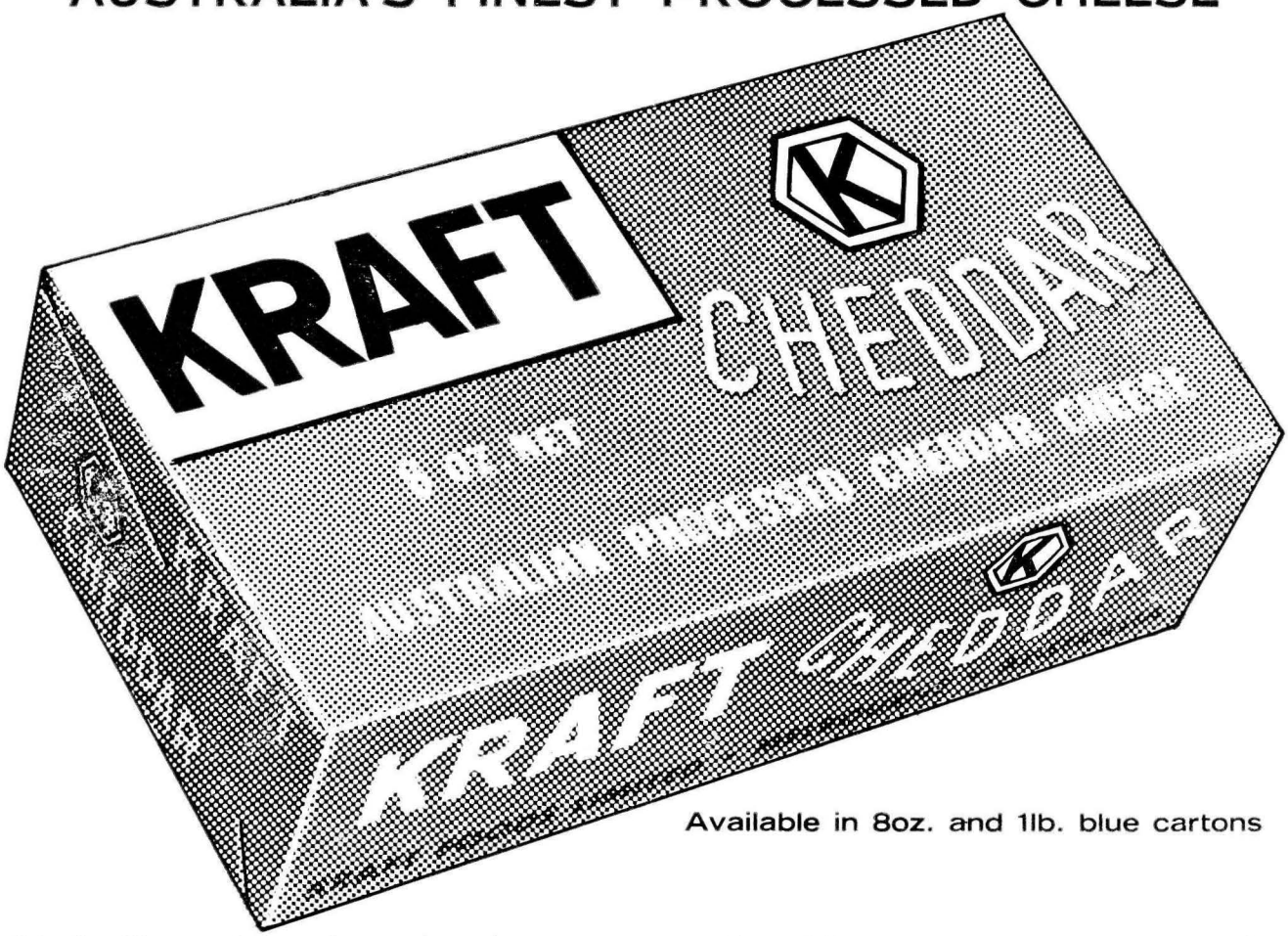


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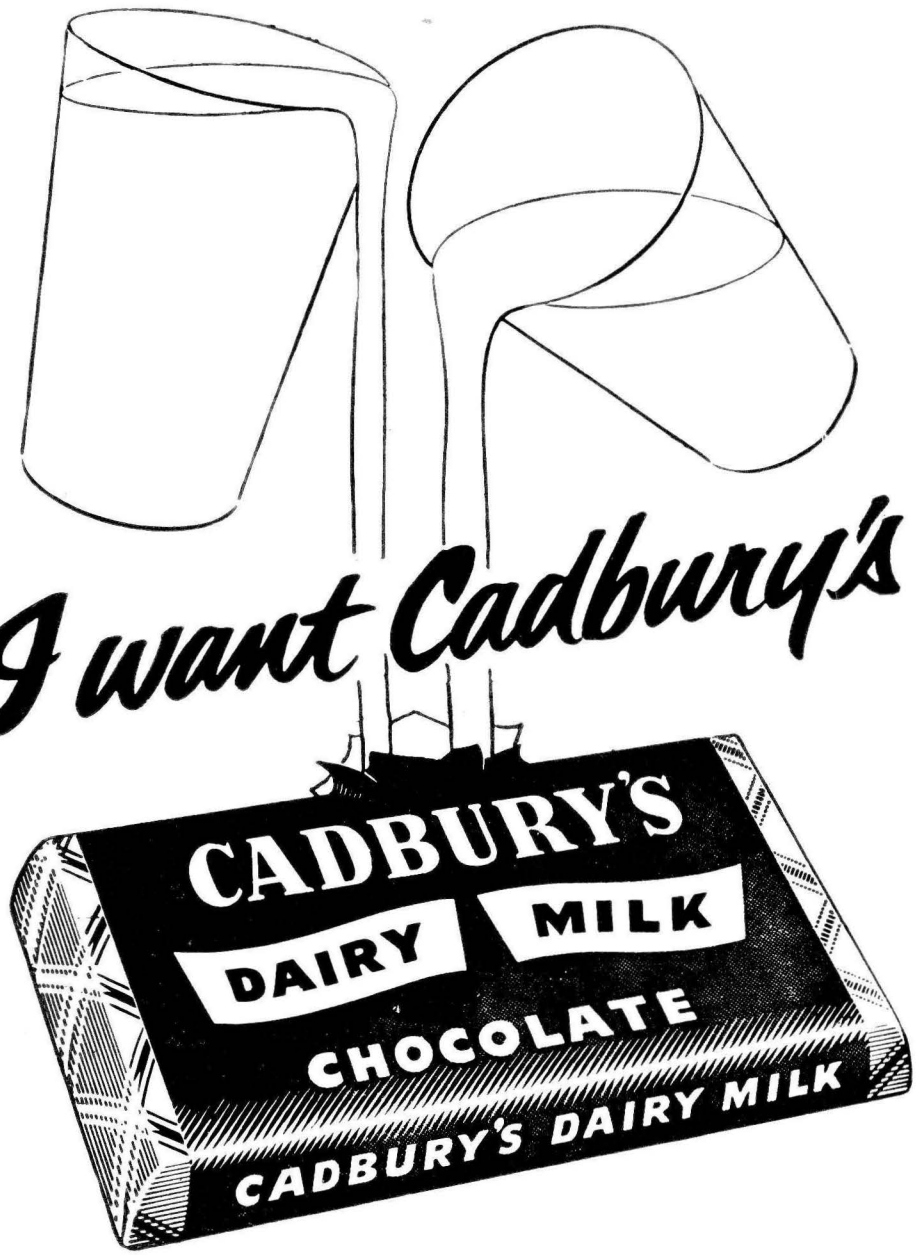


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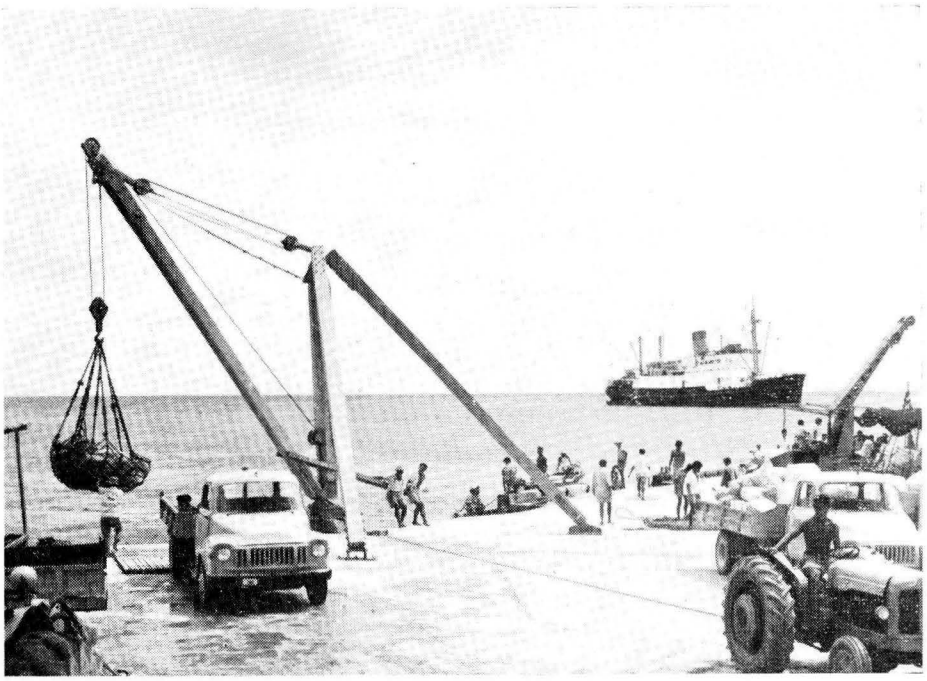
# Economic Development in the South Pacific



All cargo entering and leaving Niue Island must be handled by lighters owned and operated by the Niue Administration.

By R. C. White*

*For many years the South Pacific Commission has assisted territories with phases of their economic planning by making available the services of its Economist. This assistance has taken the form of regional and local surveys in a number of fields. In this article, Mr. R. C. White, the Commission's present Economist, describes impressions gained from his recent extensive tours of the South Pacific area and conveys some ideas about future SPC activities to help the territories and their people.*

SOME of the territories in the South Pacific area have already won their independence and the policies of the administering authorities of most of the other territories in this area are also generally directed towards varying degrees of self-government or of direct participation in territorial administration. The success of such policies requires change—social and economic—in one form or another and an acceleration in the rate of economic development in the territories concerned, resulting in improvements in the living standards of the local inhabitants.

Economic development has been defined as a process which results in a cumulative increase in output per head of population and in levels of consumption—these are commonly used as a measure of the standard of living in a community. Rapid growth in population, resulting mainly from improvements over a period of time in medical and social standards, is an increasingly important feature in this area, and it must be emphasized here that an increase in output per head requires that any increase in total output must of necessity exceed the growth in population to allow for the increases in levels of consumption required by definition.

### Consumption Levels

The extension of direct financial assistance to some territories in the form of non-repayable grants by metropolitan governments is fairly common practice and is often instrumental in providing or financing improvements in consumption levels. Such improvements cannot, of course, be considered to be the result of economic development since they are not achieved as a result of an increase in output per head.

The economies of most of the territories in the South Pacific area are based solidly on agriculture and, quite often, isolated geographical positions, infrequent shipping and air services, and hence limited communications, and the quantity and quality of natural resources are limiting factors in the quest for economic development. These territories would presently be classified in the category of under-developed economies in which economic development as defined requires for its success not only substantial changes in attitudes, both social and economic, but also very great improvements in skills.

It is not possible to impose such changes on a community simply by the attempted implementation of a set of recommended measures. This must result from the wishes of the people and from their desire to maintain and improve their present conditions and amenities, and for which they must be prepared

* Economist, South Pacific Commission.

to work hard and often to make some sacrifices. One important ingredient for the success of any such policy is the presence of incentives which are strong enough to generate this improvement.

Although some similarities exist between territories in the region (most of them rely fairly heavily on the products of the coconut palm, some on bananas, while coffee and cocoa are becoming more important commercial crops), some extremely wide variations exist in geographical features of terrain, etc., and in natural growth and products of the soil, to say nothing of differences in individual traditions and cultures. In addition to the interest they provoke for the outside observer, these differences are of tremendous importance when related to economic development. It is virtually impossible to lay down a plan of economic development for the area as a whole; each individual territory must be the subject of a separate development plan which takes into account that territory's conditions and problems and its relationships with other territories and countries in the outside world.

This does not imply, of course, that there should be no co-operation in development between territories; on the contrary, there is much to be gained from the experience of other areas both in the Pacific and in other parts of the world. One of the very important aspects of the work of the South Pacific Commission is directly related to the development of this co-operation, and the circulation of information which will assist in this regard. However, it does mean that many of the problems faced by many of the territories are peculiar to a certain set of local conditions and require solutions which cannot always be based on the experience of others.

**Copra drying in Fiji, where the coconut industry has recently been the subject of close scrutiny**

## Problems

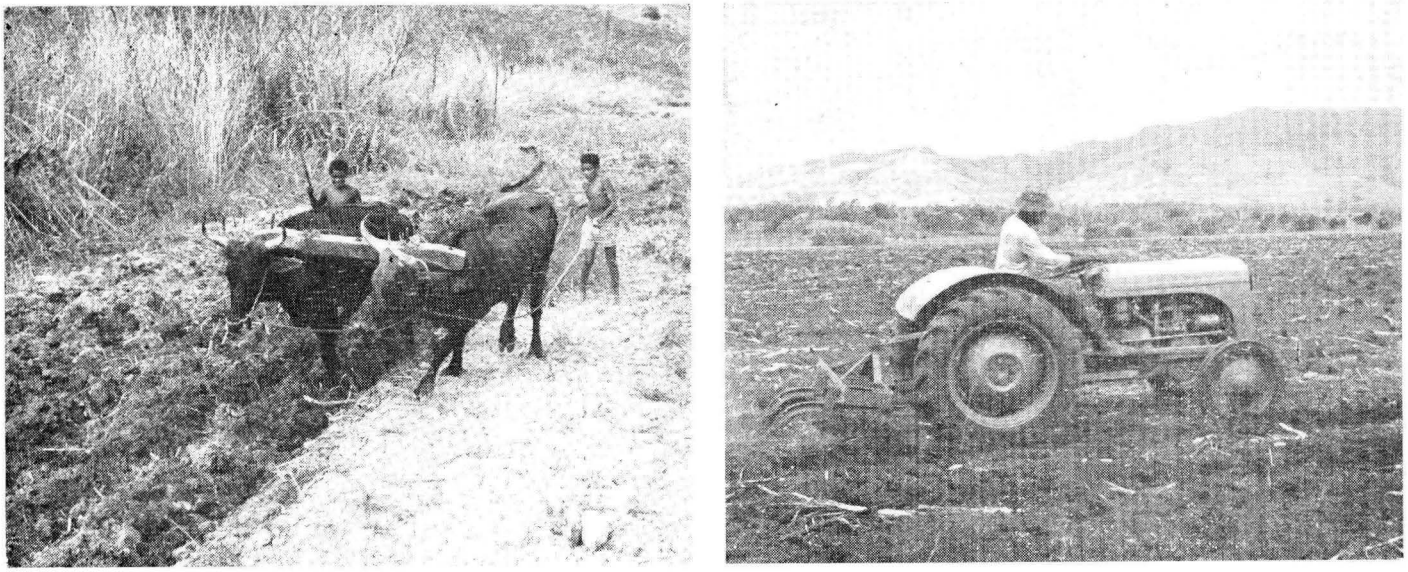
Some problems, however, are common to many territories. In most areas, limitations are imposed by customary methods of land ownership; the availability of capital for development is a continuing and widespread problem; and the development and extension of markets are confronted with obstacles which are difficult to overcome.

Customary methods of land ownership and use differ widely throughout the region, and for the most part have many of the characteristics of the communal system which are generally discouraging to the exercise of individual initiative. In most territories, however, administrations and producers are coming to realize the advantages of individual use of land, and many are actively engaged in studying modifications of existing land policies as a means of overcoming some of the limitations of these systems and of strengthening the incentives of the individual producer. This is a field in which territories may well gain from each other's experiences, and here again the Commission is actively engaged in promoting such possibilities.

**Bananas are one of the most important exports from Western Samoa, where an efficient system of collection, inspection, and shipment operates under the direction and supervision of the Agriculture Department.**

## Capital Availability

One of the major limiting factors to economic development in under-developed countries is related to the availability of capital. With some limitations imposed by land tenure systems of the kind just mentioned, and by social requirements of normal life in the village, physical capital in the form of land and labour are usually plentiful, but the necessary capital funds which are essential for the development of this physical capital are in extremely short supply. The realization of the need for these funds is be-



The old and the new in cultivation methods in Fiji

coming more strongly felt with each passing day. The establishment and consolidation of co-operative movements have moved apace in many territories and have been instrumental in the partial solution of this problem; the promotion of credit unions, savings clubs, and other forms of organized saving has also been of tremendous assistance in this regard. But this is not the complete answer. Capital is required by individuals as entrepreneurs on their own account. While some moves have been made in the territories for the provision of these capital funds on mutually acceptable terms, the supply available still falls far short of the demand.

### Medium and Long-term Credit

Because there are often problems of repayment and of providing suitable security for loans, there is still a continuing unwillingness on the part of commercial trading and savings banks and other private lending authorities to provide medium and long-term credit for agricultural development by both European and native producers. In attempts to alleviate this situation, some administrations have established special semi-governmental lending agencies. Unfortunately, however, the successful operation of these agencies is also often hampered by limited funds, or by a lack of adequate security for loans and of technical skills. The successful modification of land policies to provide for a mortgageable security of title is seen as a major requirement in this field. The necessity for continued supervision and provision of technical advice by the lending authority over the productive and marketing activities of the borrower is also a common problem but not of the same magnitude.

### Market Analysis

The marketing of the products of the various territories in the South Pacific has always been fraught with difficulties not only on the local scene but also overseas. It goes without saying that development plans which envisage an extension of the production of an existing product or the introduction of any new product or process, must include a careful analysis of market potentials. To a large extent, metropolitan governments which sometimes provide a market for the bulk of the products of an administered territory are prone to restrict imports to territories for which they have a special responsibility. This is fine in some instances and often provides a large part of the solution to marketing problems: but it should not prevent territories from investigating the possibility of widening their experience in this field.

Many of the marketing problems encountered are directly related to the

*(Continued on page 36)*

Citrus fruit has become a major export from the Cook Islands. Pest control seen here is an essential feature of this industry.

# Extension Methods Course at Popondetta Agricultural Institute

By Colin De'Ath*

*In the Territory of Papua and New Guinea, few people can be reached regularly through mass media. There are few newspapers and cinemas, only four radio stations, and no television stations. What does this mean in terms of creating a well-informed public? It means that in the absence of the above means of communication, the burden of passing on all kinds of information and implementing Administration policy, especially in rural areas, must fall on field workers.*

WHEN IT is considered that there are two million people in the Territory—the majority of them living in rural areas—and that there are only 15,000 public servants, a number of whom do not have any direct contact with the indigenous community, the thread of contact between the Administration and the people through these workers is fairly tenuous. This underlines the need for adequate training of field workers so that they can become more effective in their work and in their contact with people.

### Agricultural Extension Workers

The Department of Agriculture has for some time realized that its extension programmes can only be implemented through the work of its agricultural extension workers in the field, and that their effectiveness depends not only on their knowledge of technical aspects of agriculture but also on their ability to work with people.

To increase the efficiency of its extension officers, the department has in the past included a section on extension methods in its two-year courses for indigenous Assistant Agricultural Officers. In 1963, however, the department requested the assistance of the Department of Information and Extension Services to run a two weeks' course in extension methods for graduating Assistant Agricultural Extension Officers at the Popondetta Agricultural Institute. After some discussion between officers of both departments, a course was arranged for the concluding part of the Institute's 1963 academic year. The following is a brief outline of the course, the first of its kind in the Territory.

The course took place from 18th-29th November, 1963. There were present 27 trainee Assistant Agricultural Officers and three field workers from the Northern District. The lecturers comprised one visual aids officer, one extension officer, and two assistant extension officers, all from the Department of Information and Extension Services.

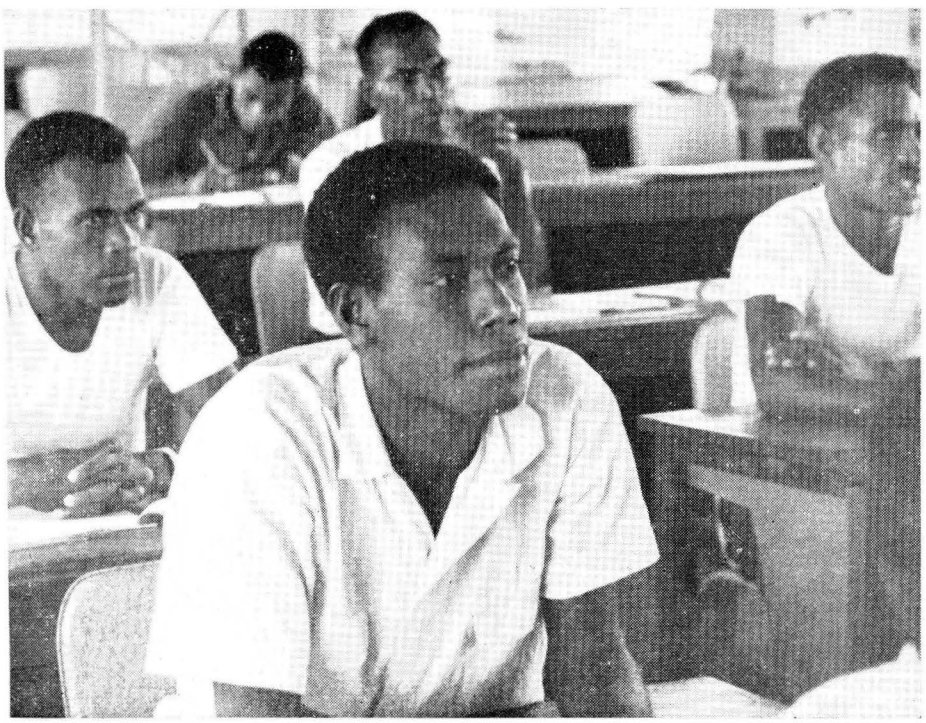
The purpose of the course was to familiarize the students with—

(i) The rudiments of sociology.

(ii) Communication and instructional techniques.

(iii) The preparation and use of audio and visual aids.

Students in the classroom at the Popondetta course

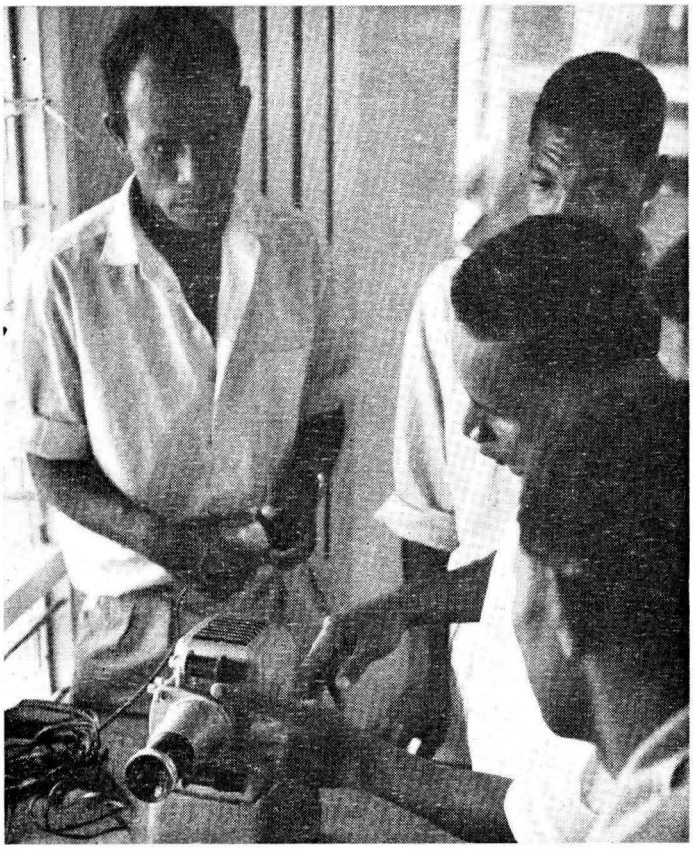


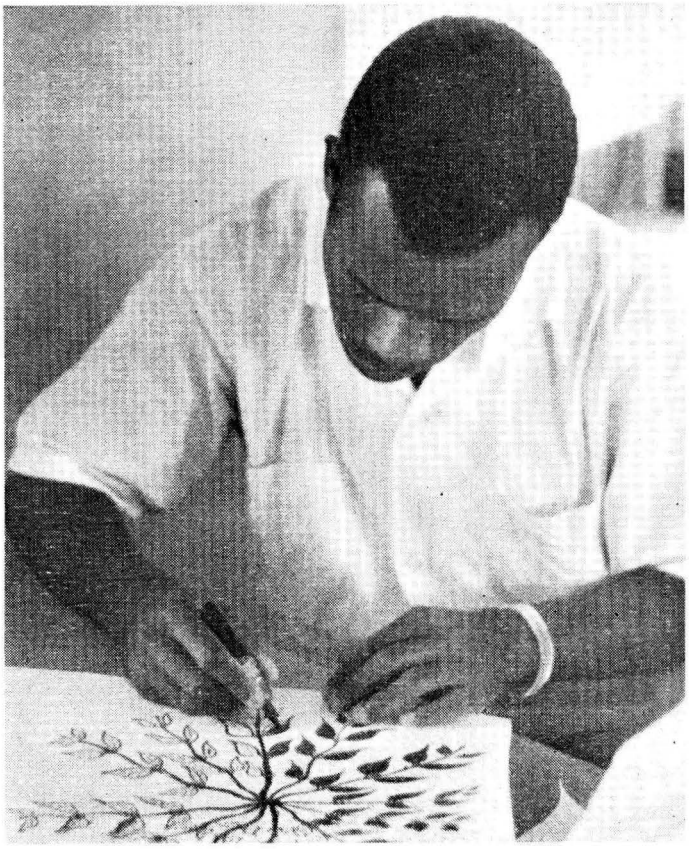
### Rudiments of Sociology

Under this division the students were encouraged to describe from their own experiences the types of social groups they could reasonably expect to find in villages in the Territory (most of them had done some field work). After the activities of 31 groups had been briefly analyzed, a broad division was made between traditional and introduced groups. The students then discussed which groups they could best work with and the approaches they would make to the people most influential in those groups. The rôle of the villager who belonged to many groups was also considered.

This led to a discussion on leadership. The students listed more than twenty qualities they would look for in Territory leaders. Again it was discovered that traditional leaders would probably need to have different qualities from those of present-day leaders. It was agreed that in less-advanced areas, traditional leaders would tend to base their decisions on their own knowledge of traditional lore and practices and would lean heavily on emotionalism, whilst the modern leader would tend to base his decisions on technological and scientific facts and would tend to be more empirical than his traditional counterpart. The students were encouraged to think of themselves

* Extension Officer, Department of Information and Extension Services, Port Moresby, Papua.





**While instructions are given in the use of a filmstrip projector by an Assistant Extension Officer, another student prepares a coffee-tree pruning diagram**

as leaders in certain fairly wide fields of activities.

There was agreement that most types of leaders would need such qualities as a knowledge of a particular skill or skills, foresight, good personality, and industry and friendliness; but that leaders in the Territory would need to be different from leaders in, say, America.

From the discussions it was agreed that Territory leaders often were afraid to be too forceful or forthright because of their fear of sorcery. It was also noted that village leadership was often shared amongst a number of men and based on the knowledge of a particular skill, e.g. gardening, sorcery, canoe making, and house building. It was also agreed that it was more difficult for a leader to emerge in the Territory than in other countries because of the importance Territory communities tended to place on egalitarianism, parochialism, and communal property ownership.

Authoritarian and democratic leadership was discussed in both the Territory context and in the light of the previous discussions on egalitarianism.

The type of leadership required at formal and informal meetings and discussions was analyzed. The students themselves participated in several "rostrum-type" discussions, panels, quizzes, and formal meetings. A fairly adequate knowledge was gained by the students of what is expected of officials at these gatherings.

For this section of the course, texts by Reg Thomson of the Department of Native Affairs and Bill Cottrell-Dormer, formerly in the Department of Agriculture, were used to stimulate thinking on community activities, meetings, etc. Films and filmstrips on teamwork, co-operation, discussions, and public speaking were supplied from the National Film Library.

### Communication and Instructional Techniques

Under this heading emphasis was placed on the most efficient ways of communicating with people and of teaching them new things.

At the commencement of this part of the course, two students were asked to leave the class and during their absence it was explained to the remainder of the students that the two absentees on their return would be asked to perform a contortionist act with a broomstick. However, the coaching for each student was done in a different way. When the first student returned he was shown a series of complicated diagrams and the steps he was required to take were explained to him. The diagrams were then taken away and no further explanation of what he was required to do was given. After 25 minutes he had not succeeded in mastering the act.

The next student instead of being shown the diagrams was shown by another student with a broomstick, the step-by-step method of mastering the act. After five minutes the second student was able to go through the act unaided.

From this demonstration the students were able to see—

(i) The importance of careful demonstration.

(ii) The importance of learning through doing.

(iii) The importance of step-by-step instruction.

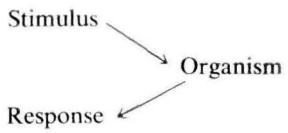
(iv) The futility of talking and using complicated teaching aids when simpler means of instruction are possible.

(v) That where teaching methods are efficient, learning takes place quickly.

Motivation was touched upon and it was agreed that promises of monetary gains and material things did not seem as important in the Territory as they prob-

ably were in other countries. The things that were important to the people were the welfare of their children, good family relationships, and community relationships. The students were not sure of the best means of motivation but agreed that if there was to be an increased interest in economic development, value patterns of villagers would need to be changed.

The following basic learning theory model was illustrated and explained through the use of the time-honoured example of food, a bell, and either a human or a canine response. Theories on instincts and learned responses were also discussed.




This section of the course on communication was tackled from four angles:

(i) The people.
(ii) The method.
(iii) The field worker.
(iv) The programme.

It was found after discussion that if field workers could not communicate effectively with people—because of language difficulties, personality problems, or for any other reason—their knowledge of agriculture could not be imparted.

For part of their practical work some of the students were asked to give demonstrations on how they would teach village people. Check sheets containing ten assessment factors were given to the remainder of the students, and they were asked to assess the effectiveness of each demonstrator. The results were averaged and the students who performed the demonstrations were able to gain a fair idea of their weak and strong points.

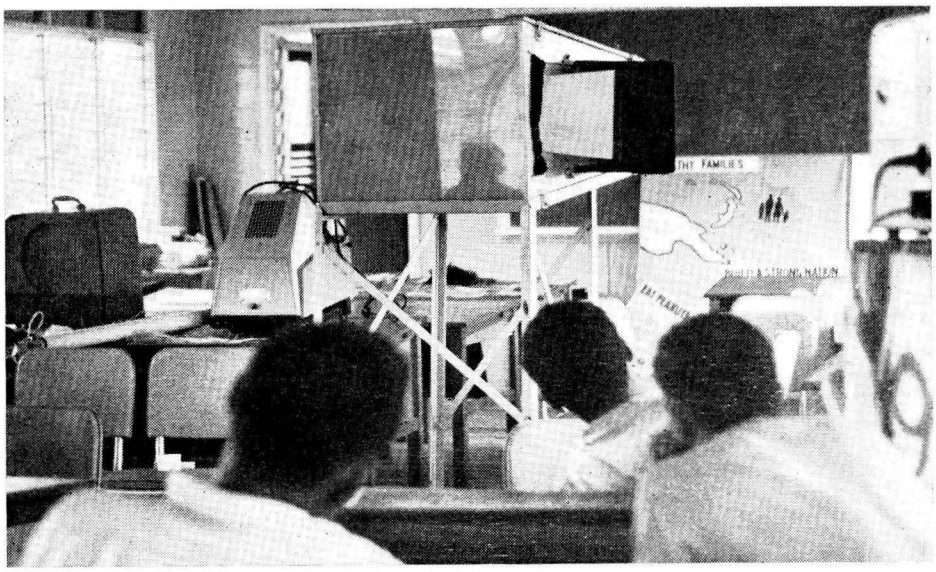
Lectures on newspapers, cinemas, and radio and television broadcasting were given and the use of mass media in the Territory was discussed.

Films were shown on lesson planning, person-to-person communication, newsprint, and the telephone. A Territory slide-film case study was also used and the students, in the light of what they had learned, were asked to point out the mistakes made by the field workers and to suggest alternative ways of working with people.

### Audio and Visual Aids

The course was fortunate in being able to use more than £1,000 worth of aids and equipment.

The use and effectiveness of the following aids was demonstrated and then discussed—models; photographs; posters; chalkboards; bulletin boards; flash cards; flannelgraphs; puppets; slides, strip films and projectors; 16 mm. films; plastigraphs, and tape recorders.



**Students watching a film in the classroom shown with the aid of a rear-vision daylight projection screen.**

The students made their own posters, plastigraphs, and flannelgraphs. The theme for their practical work was coffee growing and processing.

When the aids were discussed and evaluated, it became obvious that the field workers, when using and producing their own aids, would need to place emphasis on—

(i) Simplicity.
(ii) Suitability for village people (importance of pre-testing).
(iii) Use of local materials.
(iv) Variety.
(v) Suitability for use in the field, e.g. weight, durability, size, etc.

Films were shown on Chinese shadow plays, making puppets, care of films, and the use of chalk.

At the conclusion of the course, each student was given a kit to take with him when he went into the field.

### Conclusion

Judged by the questions asked and the quality of assignments and responses during the case study, and the amount of the students' own time devoted to using projectors, tape recorders, etc., the course appeared to have a major impact. However, the acid test will come when the students attempt to apply their knowledge in the field.

It is hoped that in about a year's time some follow-up work can be performed to enable the instructors to evaluate some of the activities of the field workers in the areas to which they have been posted.

## TUBERCULOSIS COURSE

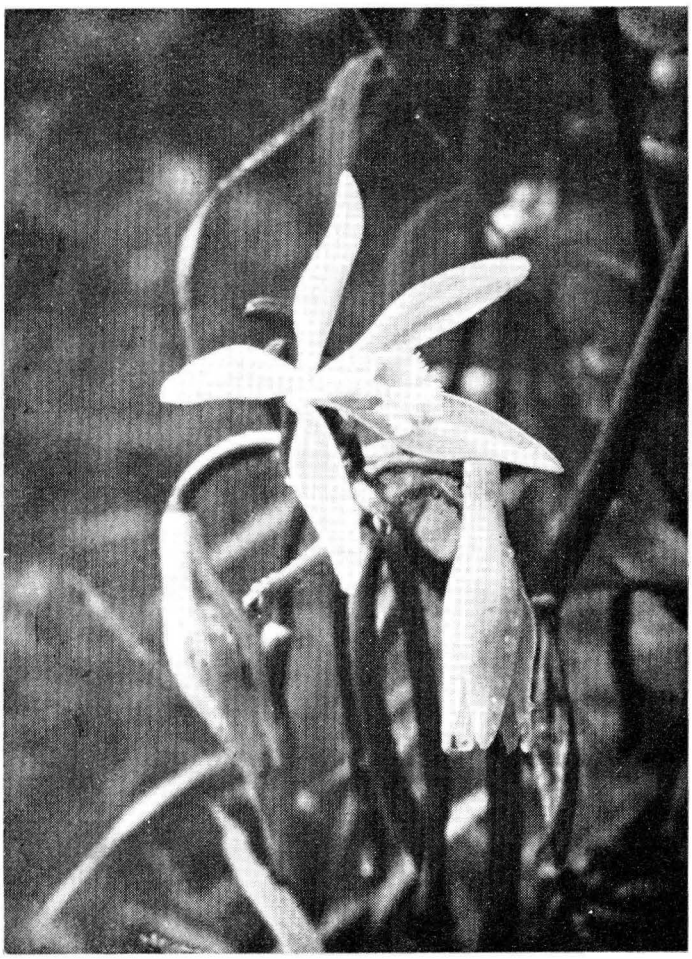
A course on tuberculosis is to be held at Nouméa from 16th July to 11th August, 1964. The course will be organized by the South Pacific Commission in co-operation with the World Health Organization's Regional Office for the Western Pacific. Several medical practitioners from New Caledonia are to give lectures and the training will be provided, for the most part, by two specialists chosen from within the area (Dr. R. H. Marks, from Hawaii, and Dr. S. C. Wigley, from Papua and New Guinea), and by staff of the WHO Regional Office, Manila (Dr. J. C. Tao, Tuberculosis Consultant, a medical statistician, and a Public Health nurse).

From the replies received from territories, it is expected that approximately fifteen participants, mostly assistant medical officers, will attend the course.

The programme is to be directed towards the practical aspects of tuberculosis control—

(i) Diagnosis (tuberculin tests, bacteriological tests, X-rays, case-finding campaign).
(ii) Treatment (chemotherapy, domiciliary treatment and treatment in hospital, organization, cost and evaluation of a treatment campaign).
(iii) Prevention (BCG, chemoprophylaxis, health education), etc.

There will be visits and demonstrations in the various services, institutions, and laboratories responsible for tuberculosis control in New Caledonia.



Vanilla flowers

# The Story of Vanilla

By D. R. A. Eden

*Apart from those orchids whose exquisite blooms are regarded as the aristocrats of the floral industry and are priced accordingly, the beautiful but less spectacular member of the genus, Vanilla, is the only variety of any real economic importance. Its pale green flowers, when fertilized, produce fruit pods; these, when processed, become the familiar vanilla beans of commerce.*

## Varieties

THERE ARE about fifty varieties of the species, several of which produce aromatic bean pods, but only three of these are cultivated extensively—

(i) The principal commercial variety, *Vanilla planifolia* (identical with *Vanilla fragrans*) is considered to be indigenous to many countries in Central and South America. Its homelands stretch from south-eastern Mexico and Guatemala in the north, to Peru and Bolivia in the south. It is a large creeping orchid with narrow, fleshy leaves and possesses longer fruit pods than other commercial varieties.

(ii) *Vanilla pompons* is sometimes referred to as the West Indian variety. It is of less importance than *planifolia* and produces thicker but shorter bean pods. It is, however, a hardy plant, more likely to thrive in poor soil or under harsher conditions than other varieties.

(iii) *Vanilla tahitensis* is a sport of *planifolia*, introduced into Tahiti many years ago. It differs from *planifolia* by having more slender stems, narrower leaves with longer petioles and shorter fruit pods. It is grown extensively in Tahiti and also in Hawaii.

## The History of Vanilla

The history of vanilla and that of chocolate run a parallel course. Indeed it is doubtful whether chocolate would have found such immediate favour with the Spanish conquerors of South America, even though served in the emperor Montezuma's best golden goblets, unless the chocolate beverage had been given such a delectable flavour by the addition of vanilla.

The Aztec "chocolatl" was a chocolate drink prepared by pounding and grinding cocoa-seeds together with chopped-up vanilla beans, with honey added to sweeten it. Peppers or chillies were also included.

The Aztec name for the vanilla bean was "tlilxochitl." According to Correll (1) the name was derived from "tlilli" meaning black and "xochitl" meaning pod.

When the pulping of the cocoa and vanilla was concluded the resultant greasy mess had water added to it, and the mixture was then beaten into a froth with an instrument called a "molinillo," a very early form of the modern swizzle-stick. In this frothy condition the concoction was served in golden cups at all the Aztec emperor's banquets.

While the Aztecs were quite open about the derivation of chocolatl from cocoa beans, they jealously guarded the secret of the flavouring agent, tlilxochitl. To them, vanilla was a precious secret, the raw beans were scarce, while their curing involved months of careful processing.

The emperor considered vanilla beans to be one of the most valuable tributes paid to him by the tribes he had subjugated. He forbade under pain of death the passing of the secret of the vanilla flavour to the Spaniards.

It has been a matter for conjecture as to how vanilla beans came to be used as a flavouring agent. The sweet-scented flowers have no aroma of vanilla, while the green pods have, if anything, a slightly objectionable odour, particularly in bulk.

Some early European records of medicinal herbs list vanilla as a stimulant. It is more than likely that its use in the Americas was for medicinal purposes long before it was discovered that it could be processed into a valuable flavour.

Archaeologists have dug up in old Mayan ruins, ceramic pots containing the remains of what may originally have been medicinal herbs. Some of these pots were sealed with corks made of fibre and unbaked clay. It is possible that vanilla beans were so stored after being dried out in the sun, and, sweating in a confined area in a hot Mexican summer, eventually developed the vanilla odour and flavour. Be sure the new flavour would be tried out in combination with the glorious "draught of the Gods," the favourite drink, chocolatl.

### Secret Flavour

While Cortez was the first European to taste the chocolate beverage flavoured with vanilla in 1519, it was not until nearly ten years later that a Franciscan friar, Bernadino de Sahagun, wrote about the chocolate mixture and described its additive, tlilxochitl.

This was the secret flavouring ingredient the Spaniards had sought and as soon as it became known, a special consignment of cured vanilla beans was sent to the Spanish court, so that the fragrant flavour could be introduced there.

Spanish merchants had already become interested in making a beverage from cocoa. This contained only ground cocoa-beans mixed with common spices and chillies and sweetened with honey. Its use even in that form had become extensive enough to interest them in the importation of cocoa-beans in small parcels from Colombia and Venezuela.

As soon as the new flavour, vanilla, was found, its use in combination with chocolate beverages became so popular that Spanish merchants were quick to realize its commercial value. They made long and tedious voyages to Mexico to buy vanilla beans in whatever quantities were available.

With the new demand for the vanilla and chocolate mixture, the value of cocoa-beans began to rise, while vanilla pods brought astronomical prices. Both products soon became in short supply and Spain was the only European country with access to any supplies. Around the middle of the sixteenth century she had a virtual monopoly on both products. Very soon, in order to meet the demand within her own borders, Spain was forced to place a total ban on the export of cocoa-beans and vanilla from her American colonies to any foreign country.

The fortunes Spanish importers made out of vanilla and cocoa were limited only by the scarcity of the two products and the import levies imposed upon them by Philip.

In the new colonies, production still lay entirely in native hands. Badly-husbanded stands of cocoa and unpruned patches of vanilla vines lay scattered among tropical rain forests along the coast of the Caribbean and from Mexico southwards, wherever the climate suited their growth.

Preliminary planting of "Piti" for the establishment of a vanilla plantation in Vairao, Tahiti

Merchants organized expeditions to the best producing areas and there built trading stations for bartering goods for cocoa and vanilla. They acquired good hillside land for the establishment of their own plantations. Their ventures into cocoa-growing succeeded and in a few years there was so much cocoa offering that the home market became glutted with the product, and the beans became unsalable. Philip was then only too pleased to lift the ban against the export of cocoa-beans to foreign countries, and to give the planters the right to sell to anyone who would buy.

### Artificial Pollination

But the planting of vanilla was a different story. The Spaniards planted the vines and husbanded them carefully. They grew magnificently, but the production of pods remained disappointingly low and most of the new plantations were abandoned in disgust. It was not until a method for artificial pollination was discovered, over two hundred years later, that vanilla-growing on large plantations became profitable.

After a six-year visit to Mexico, Francisco Hernandez became an authority on vanilla and he described and illustrated the plant which he had named *Araco aromatico*. His work was published in 1651.

Seven years later, William Piso, writing in 1658, referred to the beans by their Spanish name "vaynilla." These, he said, were combined with cocoa to make a chocolate beverage. Correll tells us that this appears to be the first time the word, vaynilla, was used, from which the scientific name of the genus is derived.

After vanilla became known, the vines were introduced into many countries, including England and the Continent, where they were presumably grown in glass-houses. The plants were prized for the beauty of their flowers, but never a pod did they produce. Even vines introduced into tropical countries such as Madagascar and the Seychelles did not bear fruit.

From the date of Bernadino's first description of tlilxochitl in 1529, the first report of vanilla fruits having been grown outside the new world was in England; 278 years later. This was at Paddington in the year 1807. The specimen was sketched by a famous illustrator of the time, Francis Bauer, whose drawing showed the vine with a fresh fruit.

A few years later, Andrews published another drawing of the same vine and called it *Vanilla planifolia*. How a flower on that particular vine came to be fertilized will never be known.

### Stingless Bee

In the vine's native habitat, the flowers were pollinated by a small stingless bee, the *melipone*, which would thrust itself into the column of the orchid in search of nectar; in doing this it would fertilize the flower. Some attempts are said to have been made to transfer these bees from the Americas, but there do not appear to have been any reports of success. With the exception of the one instance in England, there is no record of any vines producing pods outside the

Americas until artificial pollination was practised.

It was not until 1840, that a Belgian botanist, Charles Morren, some three hundred years after Bernadino first studied the plant in Mexico, discovered a method for producing vanilla pods by artificial pollination. Credit also goes to one, Edmond Albius, who, whilst working as a slave on a plantation on Reunion Island, evolved the simple match-stick method for artificial pollination which is in universal use today.

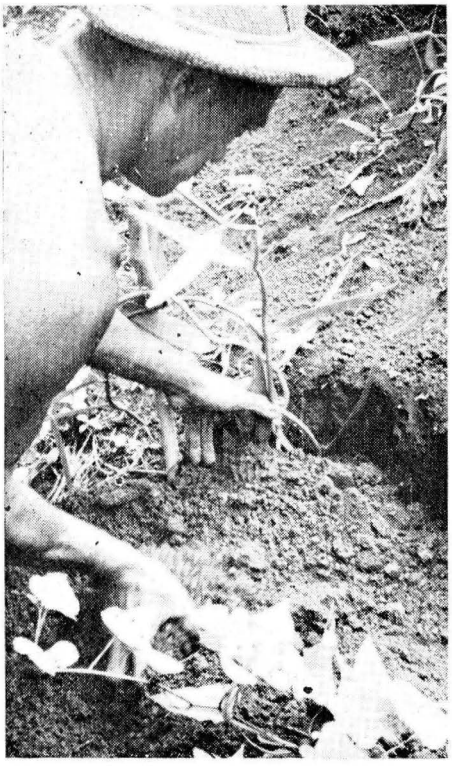
This form of fertilization made vanilla production possible wherever the climate was suitable for the vine's growth. It allowed the establishment of a major industry in Madagascar and led to the growing and production of vanilla in such remotely-separated territories as Zanzibar, Java, Reunion, Mauritius, Seychelles, Puerto Rico, and Tahiti. At the same time it gave fresh impetus to the industry in Mexico and in other countries in Central and South America.

### Planting and Husbandry of the Vine

Vanilla grows best in a tropical climate which has an annual rainfall of around 100 inches. There must be good protection from high winds wherever it is grown.

Virgin forest-land on a gently-sloping hillside is ideal. Jungle growth at all levels is thinned out or pruned to provide the right proportion of light and shade on the ground. There should be about 50 per cent of sunlight and 50 per cent of shade left after the thinning-out work has been completed. This is best checked when the sun is directly overhead. The checkerboard patterns of light and shade on the ground at noon give the planter a good idea of whether or not further branches or trees should be removed.

Tahitian grower planting a vanilla cutting



The trees which are left are used for shade and as supports for the vanilla vines. Lower lateral branches are cleared of growth to give the creepers free horizontal running.

Shade is absolutely vital to the vine's growth and well-being; where insufficient cover exists, extra trees with good lateral branching systems, such as *Erythrina lithosperma* or frangipane must be grown to supplement existing shade.

As the vines, when established, are not allowed to exceed four or five feet in height, good lateral support has to be provided. If the shade trees have no suitable lower branches, trellises of bamboo or other native wood are erected along the lines. Then, any vertical orchid shoots growing longer and higher than four or five feet, are bent over and trained into lateral growth along the trellises.

It would obviously be bad practice to allow vines to attain heights out of reach. It would complicate the work of artificial pollination and make harvesting difficult.

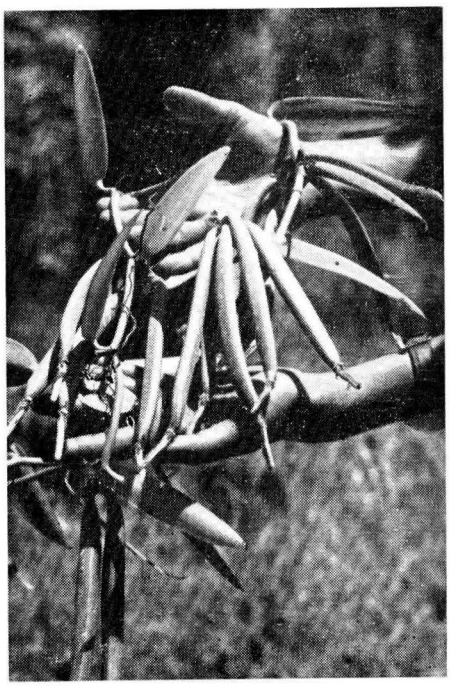
New vines are planted from cuttings not less than three feet in length. These are then laid horizontally in the ground, spaced about eight feet apart, with a similar distance between each line of cuttings.

The cuttings are placed in the soil two inches deep and at least one-third of their length is buried in the ground. The vine is secured to its support with string or Scotch tape, with two cuttings at each tree or post. A few inches at the ground-end of each piece of vine cutting is left exposed to the air to avoid the risk of decay.

### Mulching of the Vines is Important

Vanilla is a shallow or surface-rooted orchid and for this reason mulching plays an important part in its husbandry. Mulching protects the topsoil against erosion and leaching, and maintains a moist condition of the soil so essential for the comfort of the vine.

Where coconut husks are available in quantity, they may be used as a mulch and spread over the land between the rows, cups downward and disposed to within two feet of the vine bases. The space then left between the growing vanilla and the coconut husks is filled with any available vegetable matter which will compost readily. Dead coconut leaves with their butts removed also make a good mulch.



A healthy specimen of a vanilla plant in Pueu, Tahiti.

Because the land between the vine rows should be kept free of weeds, the laying down of husks or dead coconut leaves will inhibit the growth of grass and weeds and so serve a dual purpose.

Unless it is very old and well rotted, animal manure is contra-indicated around the vines. If used at all it should be well diluted with compost or good soil. The planter is advised to be on the safe side and use neither animal manure nor artificial fertilizers until he has experimented with test quantities and mixtures on a patch of control vines. Potassium and calcium are the plant's chief mineral requirements, but these chemicals should only be lightly applied.

In dry weather the soil or mulch around the vine bases should be kept moist by watering.

### Lopping Overhead Shade and Pruning the Vines

The virgin bush cover and live-planted trees used to support the vines should be lopped regularly to hold the shade and sunlight in the correct 50 : 50 ratio; this is particularly necessary just before and during the flowering season.

Lionnet (2) describes a method for promoting and pruning special bearing branches of the vanilla vine; the technique was evolved and perfected in the Seychelles.

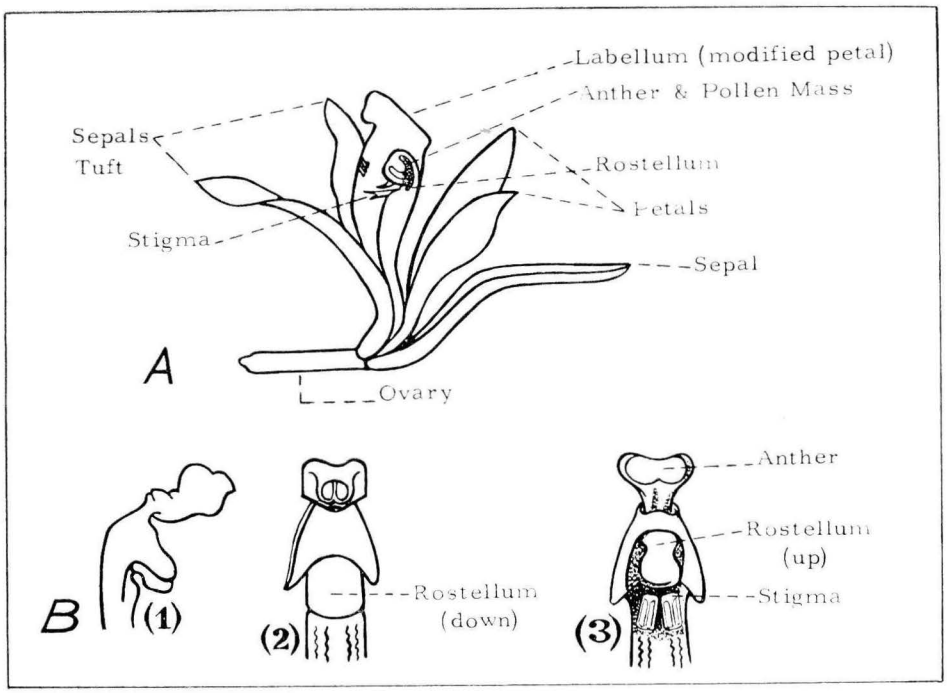
Special flowering branches or "porteurs" are selected and prepared some

nine months before flowering commences.

Five or six sturdy shoots are selected on each vine when they are about three or four feet in length. These are bent down towards the ground in an inverted "U"-shape and slightly twisted around a lower lateral support; they may then be secured there. These porteurs are tip-pruned to about 18 inches above ground level. Side shoots from them are similarly controlled.

Lionnet mentions that the result is a decreased sap flow towards the porteurs which favours flower formation. When the harvest is over, the old bearing branches are cut off and a few months later, new shoots are selected for the next season.

Some authorities recommend the complete renewal of all the old vines on a plantation every seven years. In Mexico, however, it is reported that some plantations are still in good bearing condition after fifteen years.




**A. Parts of the vanilla flower. The anther, rostellum, and stigma are of chief interest in hand pollination. At B (2), the end of the column is shown with the rostellum normally down. In hand pollination this flap or rostellum must be mechanically lifted, as at B (3), in order that the male organ (anther) can be pressed against the female organ (stigma). A side view of the column is shown at B (1).**

### Artificial Pollination

Except in those regions in Central and South America, where the special bee still visits a small proportion of the countless vanilla flowers offering, and fertilizes them, it is rarely indeed that the orchid's fruit will set without hand pollination.

Even in the Americas, hand pollination is invariably the method of fertilization now used on the plantations; it would be uneconomic to depend upon natural agents. At least two-thirds of the crop would fail to set.

The vanilla flower has three sepals, three petals, and a central organ referred to as the "column." The column is a united stamen (male organ including the anther) and pistil (female organ, comprising stigma, style, and ovary). It is combined with one of the petals, which is modified and enlarged to form lips known as the labellum.

A study of the diagram of the flower may be found the simplest way to follow the match-stick method of artificial fertilization.

It will be seen that within the column lies the anther, the pollen-bearing part of the male organ. It is covered by a flap, the rostellum, while a little lower down, the stigma, the viscid, receptive part of the female organ awaits impregnation.

The rostellum is first lifted by one hand with the help of a small sliver of wood, about the size of a match-stick. The anther, thus exposed, is then pressed down lightly with the other hand against the stigma, and the pollen transferred from the male to the female organ.

The simple operation requires a certain amount of practice and manual dexterity, because a little too much force will break the structure of the inner column, whereby the flower is irreparably damaged and the work upon it wasted.

H. F. Macmillan (4) states that from 700 to 800 flowers can be pollinated by an expert in half a day. He is of the opinion that the pollinating process must be performed in the morning while the pollen masses and the receptive stigma are fresh. If the work is left until past noon, a high proportion of successful fertilizations cannot be anticipated. Macmillan advised that only six or seven flowers in each cluster should be fertilized, while each single vine should be limited to bearing no more than thirty pods.

That's all there is to the artificial pollination of vanilla, but it took man three hundred years to discover the technique and to realize the need for it!

### Harvesting and Curing

When the pods are ready to be picked, a slight yellowing may be seen at the ends. This colour sometimes extends into a fine yellow line along the side of the bean. This tip and side colouring is the only indication of ripeness.

Some care must be exercised to ensure that the green beans are not harvested; too high a proportion of immature beans will prejudice the quality of the final aroma of the batch. On the other hand, pods which are left too long tend to dry out on the vine, then split and cast their seeds.

There are, of course, minor variations in curing in the many countries where vanilla grows, but for all practical purposes, the differences fall under two main classifications, the "Bourbon" and the "Mexican."

Madagascar is perhaps the main producer of Bourbon vanilla and this type is characterized by an exudation of fine, whitish vanillin crystals which adhere to the outside of the bean, and which are produced by the special method of curing.

The Mexican pods, on the other hand, have a sleek and oily look; their lustrous skins appear to be almost moist. Their flavour, generally speaking, is excellent.

The curing of Bourbon commences by immersing the pods in near boiling water for some 20 to 25 seconds, or by giving them several short immersions of three or four seconds each.

After this the beans are alternatively sun-dried for periods of up to two hours each morning in the full sun, then they are bundled together and rolled up in blankets. The bundles are placed in a closed sweat-box inside a building until the following day, when the whole procedure is repeated. This alternate sun-drying and sweating leads to a gradual

browning of the green beans, while the aroma slowly develops. The processing is continued for from 25 to 30 days. Towards the end of the curing, the beans are not handled individually, but are left to develop the characteristic vanillin crystals which form on the covers. If any of the beans tend to split at one end they are tied up with fine thread.

The curing of Mexican vanilla differs from the Bourbon only in the respect that the beans are not dunked in hot water before drying commences. This omission is responsible for a considerable increase in processing time. Curing is concluded only when the supervisor decides that the aroma and the appearance are right and that further processing cannot improve the product. There is never undue haste in terminating curing—slow processing is the keynote for a fine aroma—and that alone determines the product's value on the market.

Mexican vanilla is produced in many countries by following the Central American method of curing. Actually, the Mexican grower rarely cures his own vanilla pods. He sells them by weight in their green state to trading companies in the towns. The grower carts them around in bundles or baskets to various buyers, and has a lot of fun bargaining to get the best price. After that, it is the buyer's responsibility to process the beans properly.

**The end of the drying operation in vanilla preparation—sorting and packing for grading.**

Whatever the method followed—the sweating of the beans in blankets and sweat-boxes, alternated between short bursts of sun or hot-air drying—these are the broad principles for producing that wonderful vanilla flavour which has not yet been satisfactorily duplicated by synthetic substitutes.

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## NEW LINGUISTIC STUDY

A study of one of the little-known languages of New Caledonia, entitled *La Langue des Nénémas*, has just been published by the Linguistic Society of New Zealand with the assistance of the South Pacific Commission.

It is the work of Professor André-G. Haudricourt, Directeur de Recherches au Centre National de la Recherche Scientifique, Paris, who took up a suggestion made by Dr. A. Capell in his *A Linguistic Survey of the South-western Pacific*,* that the language of the Nénémas should be the object of lexicographic work.

This language, which is spoken in the extreme north of the west coast of New Caledonia, was practically unknown until 1946 when Maurice Leenhardt published the results of some studies he had made in 1938. It was to verify this work and to add to it that Professor Haudricourt carried out further studies in 1959, and again in 1962-63, in the region where the two dialects of the language are spoken—Koumac and Poum.

The languages of New Caledonia offer, as is well known, some of the greatest and most elusive problems for the linguist, and, since they are in great danger of dying out, all serious published works on the subject are to be welcomed.

Professor Haudricourt's book, one of the Te Reo Monographs published by the Linguistic Society of New Zealand, includes a brief introduction on the orthography, pronunciation, and grammatical structure of the language; a series of texts based on tape recordings of legends recounted by members of the tribes, with word-for-word translations printed below each line, followed by a free translation; and also a glossary running to nearly 50 pages. A brief bibliography, and five detailed maps of the regions where the dialects are spoken, complete a scholarly publication. The text of the work is in French.

**Mr. Kenneth Newton**

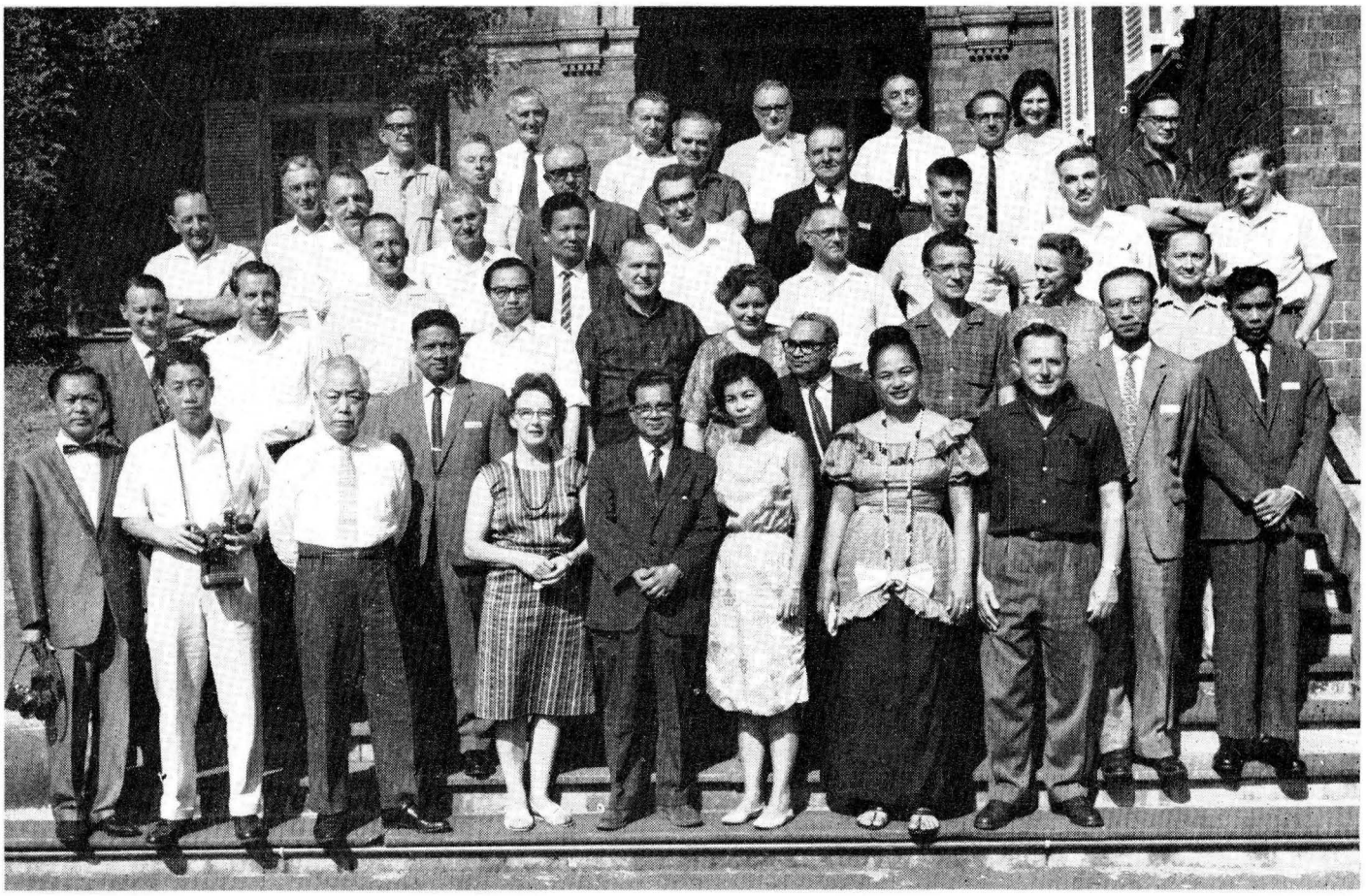
## TROPICAL AGRICULTURIST

Mr. Kenneth Newton has been appointed to the Commission's staff as Tropical Agriculturist, in accordance with a decision to establish this post within the Economic Development Section of the South Pacific Commission.

An Australian citizen, Mr. Newton is 33 years of age, married and has two daughters. He completed his degree of Bachelor of Science, Agriculture, with Honours, at the University of Perth in 1954. Post-graduate study from October, 1958, to June, 1959, at the Imperial College of Tropical Agriculture in Trinidad earned him a Diploma in Tropical Agriculture (Trinidad), and was followed by an extensive study tour through African countries where his interest was mainly centred on cocoa, oil palms, subsistence food crops, and land planning schemes.

He joined the Department of Agriculture, Stock and Fisheries in the Territory of Papua and New Guinea in March, 1955, and spent five years as Agronomist with the Lowlands Agricultural Experimental Station at Keravat in New Britain. He became Agronomist-in-charge, Highlands Agricultural Experimental Station, Aiyura, in the Eastern Highlands of New Guinea, before returning to Keravat in July, 1961, as Agronomist-in-charge.

* S.P.C. Technical Paper No. 136, Revised edition, Price 20/- Stg.



Participants in the Regional Seminar held at the University of Sydney on "The Role of Schools and Universities in Adult Education"

# Adult Education and Community Development

By Richard Seddon*

*The South Pacific Commission has recently been represented by the author of the present note at two regional seminars held in Australia on "Adult Education" and "Community Development," the proceedings of both containing much that is directly relevant to the South Pacific and therefore worthy of close consideration. The Commission has undertaken to see that all territories in the region receive copies of the official report of each of the seminars.*

## First Seminar

THE FIRST seminar was held at the Women's College, University of Sydney, from 18th January to 1st February, 1964, under the auspices of the Australian National Advisory Committee for UNESCO, in collaboration with the Australian Association for Adult Education, to consider the rôle of schools and universities in adult education, with particular reference to conditions obtaining in Asian countries.

Delegates attended from many of the Asian countries, for example, the Philippines, Japan, Hong Kong, South Vietnam, Malaysia, Burma, and Thailand, as well as from representative Australian institutions and organizations, New Zealand, the United Kingdom, the United States of America, and from the South Pacific—Mrs. M. Bethum from American Samoa, Miss Rosa Roberto from Guam, and Dr. Robert Gibson, Director of Education, Trust Territory of the Pacific Islands.

The seminar divided into two commissions—one to consider the rôle of schools in adult education, the other to consider the rôle of universities in the same field. In respect of the former it was pointed out that certain factors dictate the use of the school as a centre of expanded educational activity, particularly—

(a) The school as a permanent institution representing an important capital investment which should be used to its full capacity.

* Executive Officer for Social Development, South Pacific Commission.

(b) The staff of the school in many Asian communities is not only the sole representative of the literate adult community, but has been trained in the principles of learning and methods of instruction.

(c) The school has a variety of resources, a continuing budget and, in many communities, is the recognized institution for learning and instruction.

(d) The school is where the "adult" has received his earlier education and is therefore the place to which he may be expected to turn for further education. This will be particularly so if during his earlier education he has acquired the idea of continuing education.

Beyond these relatively technical characteristics of the schools which equip them to serve equally in the interest of the educational needs of adults as well as of children, there are long-range social and economic considerations which require that the schools move vigorously into the education of adults. The teacher trained to teach children should also have training in how to work with adults —he should, in the developing countries, be an educational resource to the entire community.

The report of the schools' commission's deliberations has been based upon a concern for the entire field of education rather than upon adult education alone. Certain conclusions which emerged from its discussions provide guidance to the principles to be taken into account in any plan involving the use of schools and school teachers in adult and community education. These may be summarized briefly as follows—

(1) The vast social, economic, and cultural changes taking place in developing countries create problems which cannot wait for solution until the children at present in schools become adults—they must be tackled by the present adults of the community.

(2) In today's world, education must be treated as a major component of social and economic development and the key rôle of adult education recognized by educationalists and governments alike.

(3) Education must be considered as a continuing process in which adult education is recognized as having status of equal importance to that of elementary, secondary, or tertiary education.

(4) The acceptance of this concept calls for a close examination of the existing curricula at all levels and where necessary, for revision, to ensure that they are consistent with the objectives of continuous education.

(5) To meet the immediate and pressing needs for adult education, governments should use as fully as possible existing resources such as school buildings, equipment, and teachers.

(6) In its adult and community work, the school should endeavour to bring together the resources of other government and voluntary agencies.

(7) If school teachers are to be used for adult and community education, it is reasonable to expect that they be given adequate training to fit them for their enlarged responsibilities.

### Second Seminar

The second seminar was held at the University of New England, Armidale, Australia, under the auspices of the University's Department of University Extension and focused attention on the present and potential future rôle of community development in both emerging and developed countries. There was again a wide Australian representation with delegates also present from many Asian countries, New Zealand, the United States of America, and two South Pacific territories—Mr. G. Linsley, a District Officer from Papua and New Guinea, and Mr. J. Pickering from Nasinu Teachers' Training College, Suva, Fiji.

The common aim of examining methods for promoting human well-being proved to be most enlightening as the various representatives brought to bear first-hand experience from 12 national areas. As each told of his setting there emerged a common emphasis on the aim to improve their understanding of community development as a concept conducive to the attainment of continuing movement sustaining the individual, family, community, and national advancement.

### Community Development

It was accepted early in the discussions that there are systems of thought and patterns of action for which the term "Community Development" is apt and that it is relevant to many disciplines. Permeating the presentation of material was a basic recognition that man and his environment are subject to constant change and that in community development lies a means of aiding people in their efforts to adjust to and participate in change—that it is a means by which people can give direction to change and not merely suffer its descent upon them.

In emerging countries the main goals of community development were seen as—

(i) Motivation of people for active citizenship through

(ii) Participation in community affairs for

(iii) Improved community well-being, enabling

(iv) Integration of communities into the life of their nations to achieve

(v) National cohesiveness and development.

Underlying these goals is the aim of establishing suitable links enabling people to participate in the formation and execution of national policies.

In emerging countries with the problem of engendering a national cohesiveness in the face of great difficulties, the situation calls for an approach and action on a scale impossible for any village-level worker or single private organization—it calls for a well-oriented government programme, in which the people have an effective opportunity of contributing and participating.

The seminar devoted attention to all relevant aspects of community development in emerging countries—its relation to government; the need for stability in policy; the effective organization of information and resources; co-ordination of agency activities; lines of communication; the place of voluntary organizations and private enterprise; economic and cultural growth—and attempted an assessment of the rôle of community development today.

Posed as problems needing use of the principles and practices associated with the community development approach were such things as the loss of racial identity, rural and urban development, rural to urban migration, the introduction of suffrage, better land usage, land tenure, unemployment and underemployment, the preservation of arts and crafts as media for social and economic development, the development of political procedures and skills, and the assimilation and integration of minority racial groups.

### Cultural Factors

The seminar therefore focused its attention on such questions as—

(1) In what ways does the concept of community development provide this approach?

(2) Where, in the life of emerging nations, can it be applied?

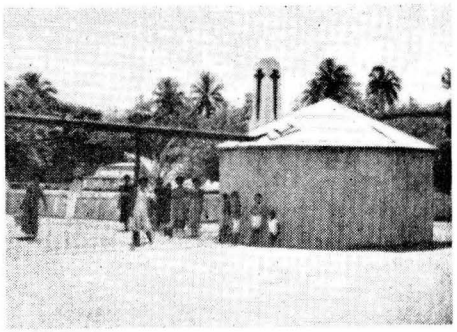
(3) What is necessary for its successful application?

The cultural factors maintaining the restricted social consciousness underlying such problems represent a great barrier to any efforts directed towards social and economic development. They permeate the life of the citizens and their communities so deeply that the only measures that can succeed in promoting development are those which can penetrate to the roots of the beliefs engendering them and bring about modification. For this there is needed an approach based on an understanding of the cultural factors and social forces at play in the situation. An approach which can aid an agent of change in achieving this no matter what his discipline might be, is the essential vehicle for his purpose.

# Drinking Water in the Tuamotu Islands

By Dr. Perrot*

*French Polynesia includes over 80 atolls, about half of which are inhabited. These very low islands, barely emerging from the sea, have a chalky soil with not even a rivulet to be found; only a few holes and pools of brackish water. The problem of the supply of drinking water has been solved by building cement tanks which are fed by rain water. These two forms of water supply, via the holes and pools and from the cement tanks, play a large part in the pathology of the islands' people.*



A village water tank fed from corrugated iron roofs.

### Water from the Tanks

In every village, each house, all public buildings, and even the church or temple are equipped with a huge cement tank which provides a public or private water supply. The tanks are usually raised on a cement pedestal which prevents the possibility of water infiltrating from below. The tanks are filled by rain which falls on to the corrugated roofs of the buildings, and then drains into the tanks through gutters. To avoid the possible danger from outside pollution, these reservoirs should be thoroughly sealed.

But at present this is not being done. The top of the tank is generally left open, and as a cover, the inhabitants use a few sheets of corrugated iron weighted down with stones. A falling coconut, or the wind, is sufficient to move these sheets, which are just as likely to fall into the tank. Even when covers are fixed more securely, there still remain openings which allow dust, rats, lizards, flies, mosquitoes, and many other kinds of insects to enter.

Rain water falling on to the roofs of the buildings collects the various substances in its path, which fall directly into the tank without passing through any kind of filter; furthermore the tanks are never properly emptied out or cleaned.

A glance into these water tanks will result in an almost unbelievable sight. On the surface one will find, amongst other things, paint, rust, dust, mosquito larvae, and pieces of wood. The sides and bottom will be covered with a thick coating of mould. In the dirty water there will also be old tins, boards, sheets of corrugated iron, coconuts, and various other bits and pieces. Rats sometimes drown in the tanks, with the ensuing decomposition of their bodies. A random sample of water taken in a transparent container will generally be cloudy and full of mosquito larvae and foreign matter in suspension.

Chemical analysis of the rain water itself, taken in the last few months to test radioactivity, has shown it to be very pure and similar in content to distilled water.

Bacteriological analysis of the rain water in the tank, however, is of much greater interest. One analysis out of six has shown the presence of colibacillus. It is certain that this impurity is of animal origin. It is known that rats carry salmonellae among other organisms, and recent research has shown that salmonellae are also carried by lizards. The first drops of rain will wash impurities such as microbes and animal excrements—particularly those of rats—straight off the roofs and into the tanks.

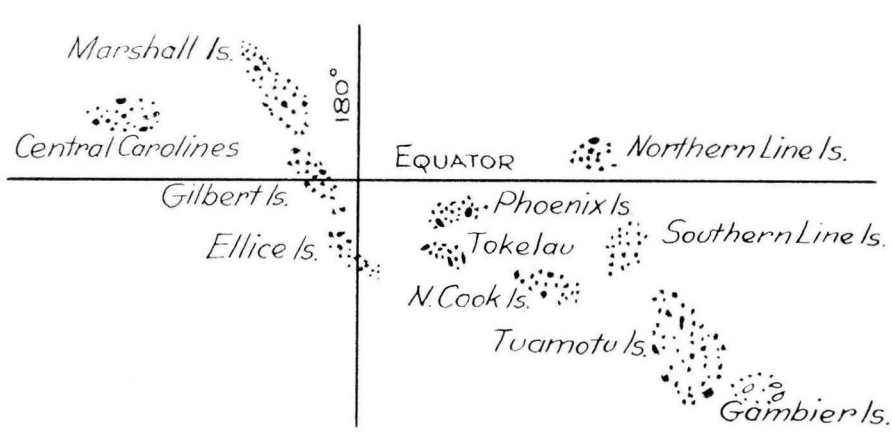
It is this water, stored without any precaution or safeguard, and used as drinking water, that is the cause of most of the trouble.

### Hygiene of the Atolls

To be aware of its harmfulness, it is enough to know that this water is never boiled; the inhabitants drink it just as it is. It is true of course that they do not only drink tank water, but also drink large quantities of coconut water. One is fully convinced, however, that polluted tank water, absorbed in greater or lesser amounts according to the island, is often the cause of gastro-intestinal infections.

During the frequent visits made to the islands over the past three years, the author has been surprised by the high proportion of patients (30-40%) who complained of digestive disorders accompanied by diarrhoea and which were found to be colitis and entero-colitis. It is often suggested that toxic fish is to blame—instead of the real culprit—the water.

In the Tuamotu Group, infantile mortality, caused particularly by gastro-enteritis, is extremely high. During a period of five years from 1956-1960, it amounted to 42% of the total deaths of children from birth to four years of




The low coral atoll groups of the Pacific

* Medical Officer of the Tuamotu-Gambier Group, French Polynesia.

age—and to 33% for children from birth to one year of age. It would certainly not be unreasonable to believe that water was an important factor in this mortality rate; moreover, stagnant water in the tanks makes a perfect site for the development of mosquitoes.

### Water Holes

On many atolls, the islanders have dug shallow holes for use as wells, mostly without a lip. Water to be found in these wells comes from rain water which has infiltrated the coral and lies on top of the brackish water. The water in these holes is full of various impurities and contains brown and green algae.

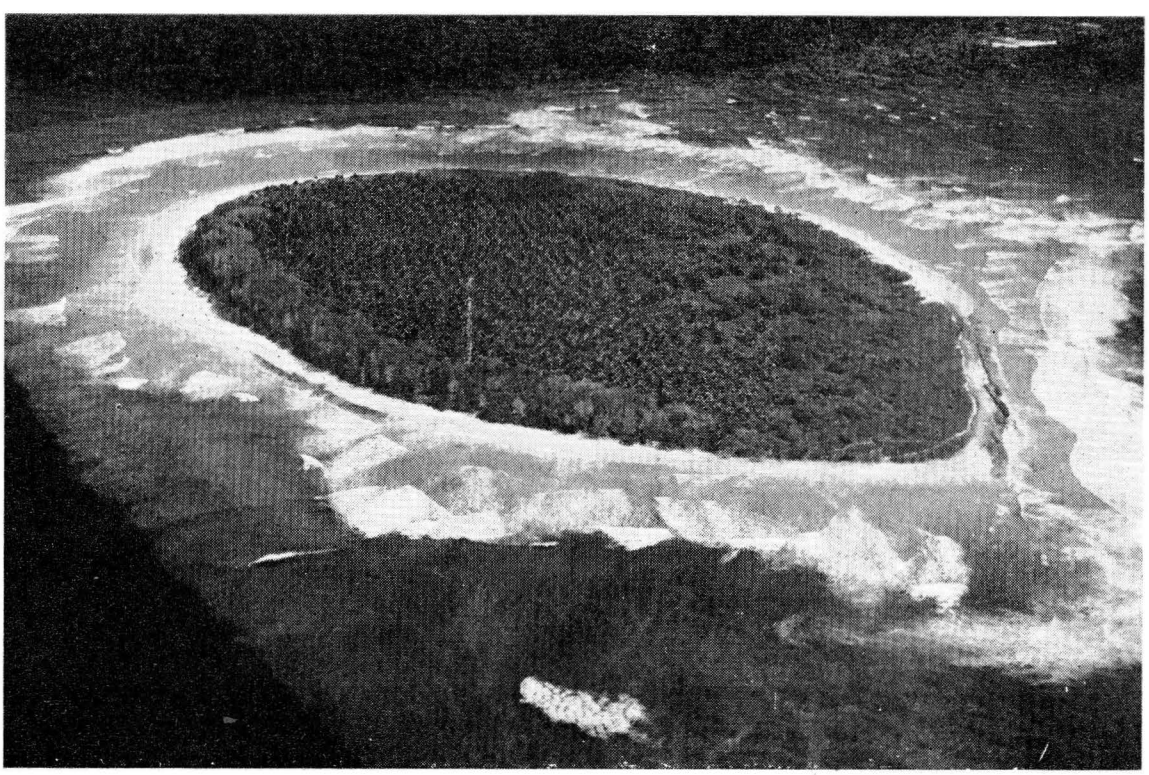
An analysis of a sample taken from an atoll where there was a typhoid epidemic showed the presence of coli-bacillus. There was clear proof that the water from a hole was contaminated with salmonella typhi. On the atoll in question, 300 people had gathered in 1962 for the pearl-shell diving season, though the population was normally only 20 to 30 people. There were no cases of typhoid during the first month while the population was using water from the tanks. In the second month, the tanks became dry and the population obtained water from an unprotected dish-shaped hole. The immediate result was 15 cases of typhoid during the second and third months. Unfortunately, the male nurse had left before the outbreak, as about two-thirds of the shell divers had returned to their own islands because of the scarcity of shell.

Typhoid fever has always been endemic on the atolls. It has decreased during the last three years for two reasons—the first is that typhoid immunization had been given systematically in 1958 and 1959. The second is that the administration and the population of the atolls had made a great effort to build tanks. The water from holes, which is known to be dangerous, is rarely used except from sheer necessity.

The water problem on the atolls would not exist if the tanks were properly constructed and if the inhabitants took certain simple precautionary measures. These are as follows—

1. Water holes. These must definitely be condemned and should be covered up so that children are unable to paddle and play in them.
2. Water from tanks.
   (a) Correct the defects in the tanks—
      (i) To ensure that the tanks are absolutely pollution proof, all covers made of corrugated iron sheets or boards must be forbidden, the tanks must be covered with a cement slab fitted with a trap-door.
      (ii) Rain water should be filtered before entering the tank. The best system is a double filter, the first with a wide mesh and the second filter with a finer mesh.
      (iii) Two to four holes should be bored in the sides of the tank and covered with mosquito netting to provide ventilation and allow for the dissipation of odours.
   (b) Other essential measures—
      (i) The tanks should be emptied twice yearly and the insides and bottoms scraped and brushed out. This advice has been given on numerous occasions to the headmen in the villages and has always been received with lethargy and a complete lack of understanding. "But we shall have no more water," is the invariable reply. In point of fact, there is no question of emptying and cleaning all the tanks at the same time. Emptying and cleaning the tanks is essential and is a most important measure; it should be included in the duties of the district council.
      (ii) Water in the tanks should be chlorinated regularly.
      (iii) Water should be boiled before use.

The problem of supplying drinking water on the atolls is a comparatively simple one to solve, whilst the necessary precautions are easy to implement.



A typical scene from the air, this particular atoll is in the Marshall Islands, U.S. Trust Territories.

"Fast fisk!" is the cry as the harpoon goes home

# Whales and Whaling in the Western Pacific

By R. J. A. W. Lever

*The literature of whaling deals either with the early efforts in the Arctic with the hand-harpooning of Greenland whales from open boats or with the much later campaigns in the Antarctic against the blue whales, using harpoon guns from chaser ships. In fact, however, during the last 70 years or so, the term "whaling" suggests killing by explosive shells and then the mechanical flensing in the attendant factory ship in southern polar regions. The classics—Melville's "Moby Dick" and Bullen's "The Cachalot"—occupy a unique place in literature but descriptions of whaling in the Western Pacific are scattered in various books and journals and are not easy to find. This article attempts to give an account of whaling activities in Melanesia and Polynesia which it is hoped will be of some value.*

## Early History

It is generally accepted that the first whalers in the Western Pacific were operated on a small scale by the British in 1775, but serious whaling did not begin till the voyage in 1789 of the *Amelia* shortly after the arrival of Phillip's "First Fleet" in New South Wales. The powerful East India Company was able to prevent British whalers from operating in the Pacific Ocean at this time—and it wasn't until 1802 that these powers were finally relinquished. Naturally, these limitations encouraged the American whaling fleets, who became supreme in this area from the end of the eighteenth century till about 1860, except for the three years of the War of 1812. Few groups of islands in Polynesia went unvisited by the Nantucket and New Bedford whalers, who reached their heyday in 1846 with no less than 730 vessels engaged in this trade and taking £1,400,000 worth of whale products in that one year alone. The ultimate effect of this immense onslaught on the whale population will be dealt with later.

Because of the annual arrival of large numbers of the Southern right whales in Tasmania and New Zealand, there developed so-called "bay" or "shore" whaling in these countries in which the whales were captured only short distances from the coast.

## Types of Whales Hunted

Only three species were hunted on a really large scale; the sperm, Southern right, and humpback whales. The sperm or cachalot (*Physeter catodon*) reaches a length of 60 feet in the male but only 30 to 35 feet in the female and has a very narrow sledge-like lower jaw with from 20 to 25 pairs of teeth, which provide the "ivory" described later. In the head also were the gummy, fatty spermaceti from the lower or "junk" part and the very valuable sperm oil from the "case" in the upper portion. This sperm oil was the source of the spermaceti candles from which the original unit of light, "candle power," was calculated.

It is interesting to note that the term "sperm whale" is derived from the odd idea of the old-time whalers that the spermaceti was actually the creature's sperm—the French were less imaginative and used the word "cachalot." The average quantity of oil obtained from one whale was six tons but a figure of 15 tons was sometimes reached. Finally, there was the more valuable ambergris, secreted in the whale's intestine, not in the stomach as some authors state. Even to this day, chemists have not been able to synthesize this product on which perfumers still depend and which costs in the vicinity of £4 per ounce!

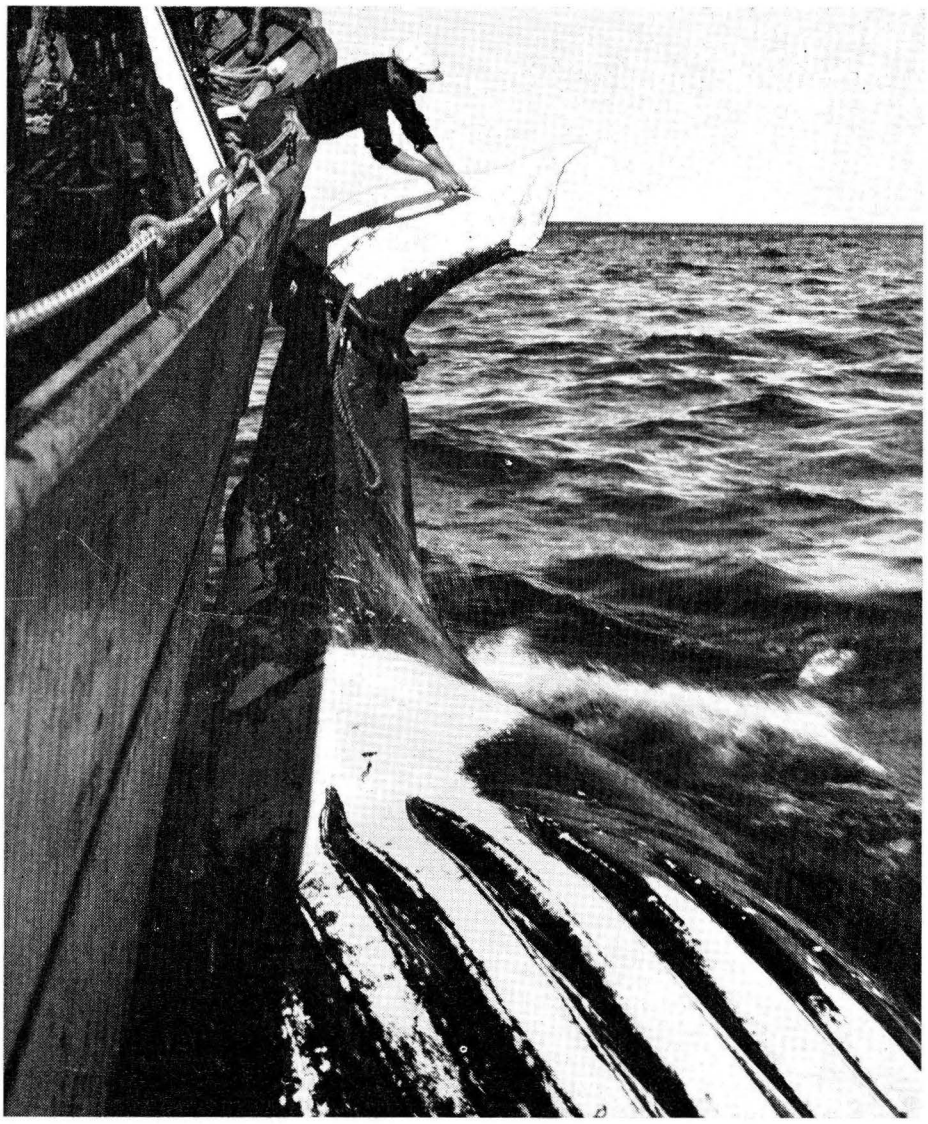
The food of the sperm whale is confined to squid, giant specimens of which, obtained from very great depths, have been found in whales' stomachs. Dives of 400 fathoms are quite usual and up to 600 fathoms recorded. This whale is a lover of warm tropical seas and sperms found beyond 40°N or 40°S usually prove to be rogue males banished from the herd, as sometimes also happens with elephants. In the early whaling days, schools or "pods" numbered up to 100, but extensive hunting, in which nursing mothers and young were not spared, soon reduced this figure to about 15.

"Moby Dick," written in 1851, was based on actual incidents which occurred on board the U.S. whaler *Essex* in 1820 when sailing near the small Hender-

son Island, just off Pitcairn. An interesting habit of whales is quoted by Derrick (1) in which a small government vessel at anchor in a bay in Koro Island, Fiji, was chosen by two whales as a convenient object for rubbing their sides against so as to scrape off their barnacles—the reaction and language of the skipper is not recorded!

When dealing with the Southern right whale (*Balaena antipodarum*)* practically everything applicable to the sperm whale is found not to apply. The Southern right male rarely reaches more than 50 feet in length. It has huge lower jaws devoid of teeth, and from the roof of the upper jaw it has blankets of whalebone or baleen. Unable to chew, the whale obtains the large quantities of food it requires by swimming open-mouthed through shoals of shrimp-like "krill" or Euphausians, which are swallowed as the water is strained through the fringe of baleen. These Crustacea, about 2½ inches in length, do not occur in tropical seas, so the right whale in turn frequents both the South Polar regions and the waters around New Zealand and southern Australia, where they migrate to breed in sheltered inlets. Over a number of years at Twofold Bay near Eden, N.S.W., there was the remarkable occurrence of porpoise-like killer whales (*Orcinus orca*) which drove the much larger right whales into shallow water and attacked them there, to the great satisfaction of the bay whalers.

The third species of whale is the humpback (*Megaptera novaeangliae*) which reaches a length of 45 to 50 feet in both sexes and has very long flippers up to 14 feet long. It is very prone to attack by both lice and barnacles. Its distribution during the whaling days was restricted to Tonga, western New Caledonia, off the northern tip of New Zealand, and in the Cook Strait. Early records show that it was usually the first whale to be hunted when new fields were opened up, but it soon moved to other regions, either from fright or intelligent anticipation.



**The whale is inflated with air to facilitate towing. Strokes cut in the tail indicate the catcher's identity and the number of the catch for the day.**

## Main Whaling Grounds and Island Bases

Most British and American whalers entered the Pacific via Cape Horn, sailed up the coasts of Chile and Peru to the Galapagos Islands, then along the equator and so down to the Marquesas. There was also some movement of American vessels coming south from Hawaii. Certainly by 1813 there were a number of bases, described as forts, in the various sheltered bays of Nukuhiva and Hiva Oa, the scene of Melville's "Typee." This was written in 1846, just after the first French occupation of the Marquesas. Other bases were at Tahiti and Moorea in the Society Group, of which Cook's associate, Sir Joseph Banks, commented that, in the forty years prior to 1806, the human population had been decimated since the arrival of the European—and for this the whalers must bear their share of guilt.

One of the most intensive areas of whaling activity was the extensive equatorial belt stretching as far west as the Gilbert Islands, and known as the "On the Line" whaling ground, with the ships at work there throughout the year. By contrast, the waters around northern New Guinea and the Solomon Islands had a season restricted to the months from October to March. Further east in Fijian, Tongan, and Samoan seas there was again year-round sperm whaling. To the south, in the region frequented by the Southern right whale, most activity occurred east of the Kermadecs, the Cook Strait, and off the South Island of New Zealand. The vicinity of the Kermadecs was given the name of the "Vasquez Ground," in which both sperm and right whales were taken.

Credit for the first serious attempts to plot the most fruitful whaling grounds belongs to Commander C. Wilkes of the U.S. Exploring Expedition of 1838-42. Nearly a century later, his fellow-countryman, C. H. Townsend, made a careful study of the log books of 1,665 whalers, and recorded the sites where nearly 54,000 whales had been harpooned. Far too little attention has been paid by British writers to his paper (3) with its four large maps showing the capture of the economic whales on a month-by-month basis throughout the whole world. The map accompanying this article has been re-drawn to summarize the very detailed information

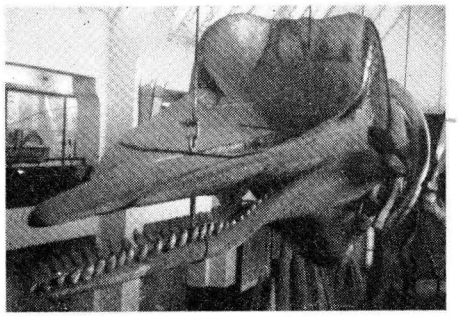
* The writer has followed Burton's recent classification (2) in which *B. antipodarum* is used for the Southern right whale and the more usual *B. australis* reserved for the South Atlantic whale.

compiled by Townsend from the original sources.

Some of the favourite localities used as bases by the early whaling ships were Levuka and Kandavu in Fiji, Rotuma Island, Nuku'alofa and Vava'u in Tonga, and Pago Pago Harbour and Apia Roadstead in Samoa before its division into American and British spheres. Further south, whalers by the beginning of the 18th century were using Hobart and Launceston in Tasmania, and Port Jackson, Twofold Bay, and Portland Bay in Australia. Similar bases were soon established in New Zealand, of which Kororareka (Russell) in the Bay of Islands, Akaroa in the Banks Peninsula, Kapiti Island and Cloudy Bay in Cook Strait, and Dunedin are among the best known. Darwin landed at Kororareka when H.M.S. *Beagle* called there in 1835—at that time between thirty and forty ships were at anchor. What would one have given for a photographic record of these vessels and their tall timbers, now only a memory?

### Blowing or Spouting

It is only within the last ten years that a reasonably satisfactory explanation has been given about the blowing of whales. It is many years since the early erroneous belief that sea water was spouted from the blowhole, but one problem still remained to be solved. If the spouting was actually the whale's breath, how did one account for it being clearly visible in hot tropical latitudes? Because, to be seen so easily, there should be a very marked difference in temperature, familiar to us all in cold weather. The explanation, given as recently as 1955, by Fraser and Purves (4), proved that the column of exhaled breath from the whale's lungs contained a nitrogen-charged foam, expelled in droplet or emulsion form so as to be visible even on the hottest tropical day.



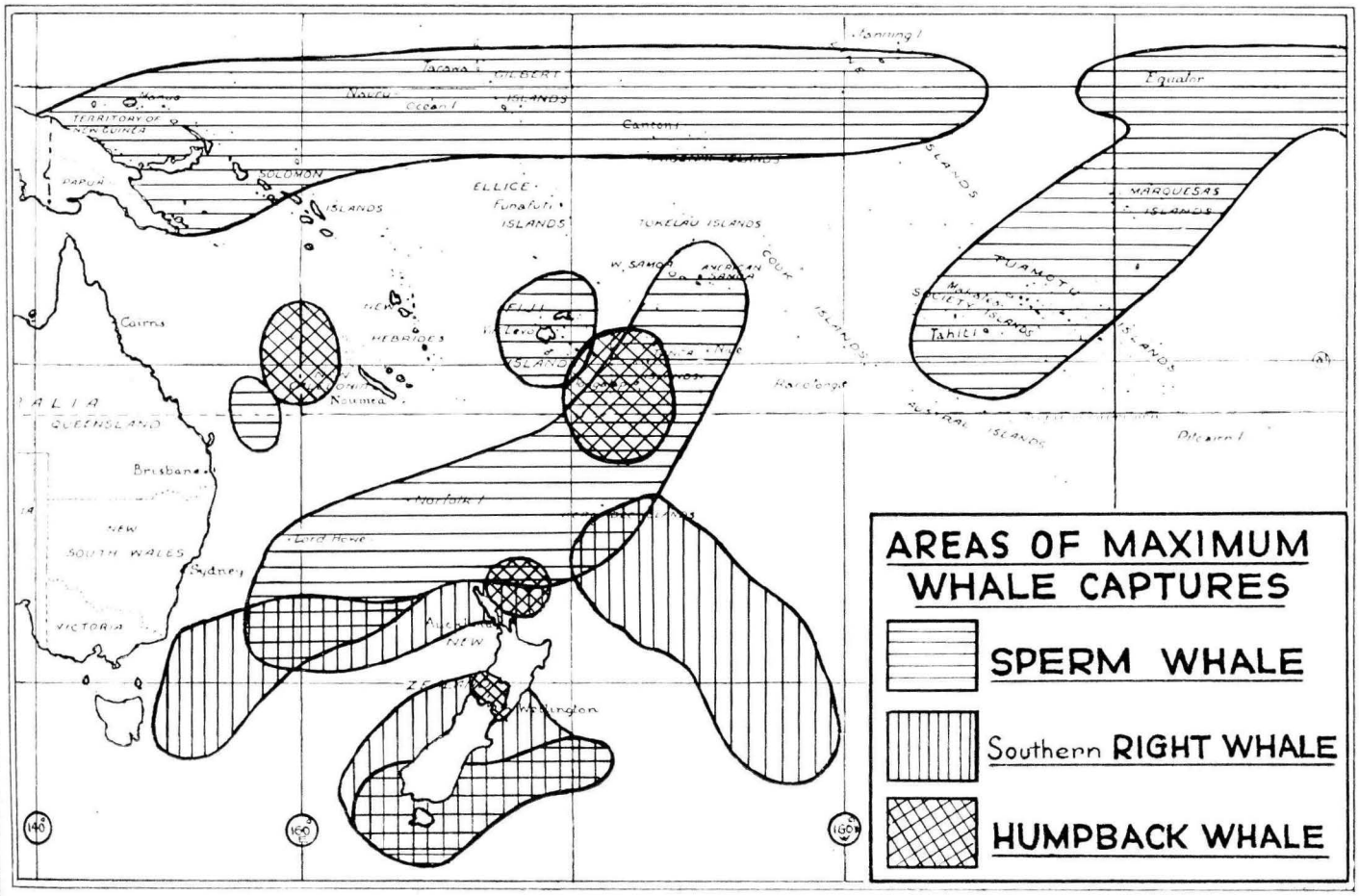
Skull of sperm whale

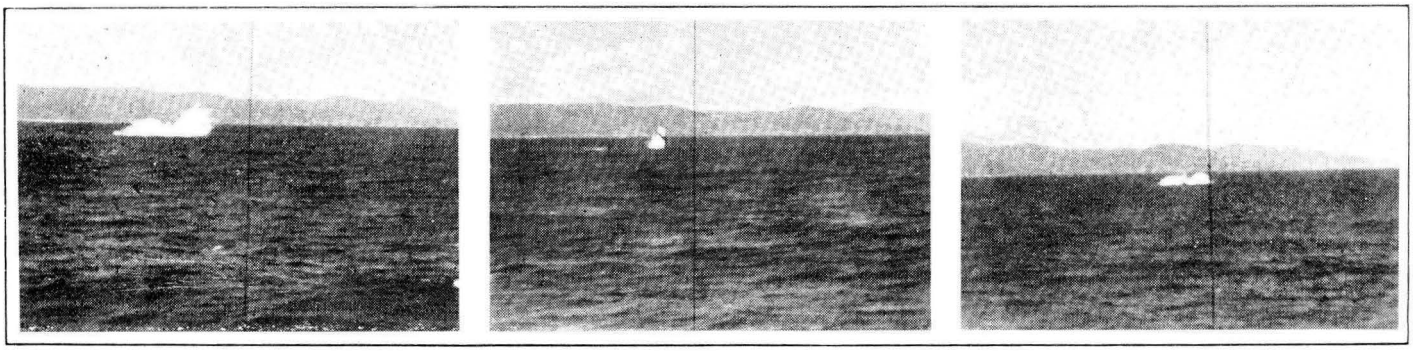
Differences in the types of spouting enable one to recognize the species of whale. The sperm whale's spouting issues from a single serpentine slit near the snout in the form of a column at an angle of 45°, whereas in the right whale, a nearly vertical double spout comes from a pair of parallel blowholes placed much further back on the head. Respiration in the sperm whale is regular with six breaths per minute for ten minutes followed by a diving period of 50 minutes. Departures from these times have been recorded, e.g. Slijper (5) quotes dives of 1½ hours. The series of photographs accompanying this article were taken by the author off the island of Kandavu, Fiji, and are enlargements from a sequence on 16 mm. cine film showing a whale splashing, taken from as near as the skipper was prepared to sail; this whale did not blow.

### Whale Ivory

Besides spermaceti and ambergris already mentioned, sperm whales also provide ivory from the teeth in the lower jaw. To relieve the monotony of long periods of enforced idleness at sea, the old-time whaler spent many hours on what was called scrimshaw. This involved smoothing the teeth with a file or grindstone, followed either by engraving a pattern with a sail needle or actually carving the teeth, and finally polishing with wood ash.

In Fiji, the islanders still attach a high





Splashes caused by a humpback whale after jumping out of the sea off Kandavu Island, Fiji; these pictures were enlarged from a sequence of cine film shot by the author.

value to the polished teeth of the sperm whale, which are pierced at both ends and threaded with coir fibre. These *tambua* play an essential part in tribal ceremonies, and on recent Royal visits it was difficult to obtain enough of these teeth, largely as a result of their acquisition by New Zealand and American servicemen during the war.

In former times, the teeth were laboriously sliced lengthwise into pointed sections which were then made into necklaces. These were sometimes mistakenly believed to be dogs' teeth.

### The Decline of Whaling in the Pacific

The period of intensive whaling in the Western Pacific lasted about 70 years, from 1790 till 1860, with a brief golden age from 1830 to 1845. The decline in the industry was because of a combination of events beginning with a financial crisis in the U.S.A. in 1857, followed four years later by the Civil War.

The short-sighted policy of ruthless slaughter caused the number of whales to be drastically reduced, and they were only saved from virtual extinction by the discovery of petroleum in Pennsylvania in 1859. Between 1830-40, no less than 41¼ million gallons of oil were obtained from the sperm whale (6). The number of Southern right whales killed between 1804 and 1817 by American whalers alone, reached the fantastic total of 193,000, or a yearly average of nearly 15,000, a mortality rate no animal could stand for long. Similar casualties inflicted in Australia and New Zealand, coupled with the withdrawal by Britain in 1842 of a protective tariff on foreign oil, led to the end of bay whaling. Petroleum replaced whale oil in the manufacture of candles and its use as oil for lamps; whaling then went into a rapid decline intensified by the substitution of flexible steel for whale bone in the corset industry. The respite for the whale came just in time to enable the population to rebuild and recover in much the same way as with bison on the land.

The effects of the whalers themselves on the native population were grave and far reaching. The introduction to primitive and isolated people of gin, rum, muskets, and new diseases (tubercular, venereal, and measles) began in the Pacific when the whalers, sandalwood traders, and recruiters first called at the islands. Of all the European types one's sympathy is most with the whalers as they landed on the beaches, after perhaps three years at sea without fresh meat, fruit, or vegetables, and in need of drinking water, firewood, and women. Unfortunately, with the ending of large-scale whaling in the 1860s, the effects of these first contacts were too deep-seated to be removed. Happily, a balance was later reached and the native population, with the exception of a few areas, made a recovery in numbers.

Sperm whale teeth or "tambua" from Fiji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(1) Derrick, R. A. 1957. "The Fiji Islands." Suva.

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### Economic Development in the South Pacific

*(Continued from page 20)*

assembly of the total product, in many cases involving collection from a large number of small producers, the preparation of the product for the final consumer, and the actual distribution to the consumer. Increased efficiency in the field of marketing demands improved transport facilities, technical advances in the storage and processing of those products which cannot be marketed in their original state, and greater efficiency in both professional and non-professional marketing organizations to ensure a more advantageous disposal of the product and a satisfactory return to the producer. Progress in this direction has been significant but much still remains to be done.

Continued efforts in these several directions are a necessity, with improvements in the efficiency of labour and capital by improved training methods and the creation of incentives, by advances in technology, and by more efficient organization and leadership. The success of any plan for economic development depends, of course, not only on the extension of existing economic activities but also on improvements in the quality of the people themselves by extended health services and by education and training.

### Leadership

The requirement for experienced leadership is not unimportant. It has been almost fundamental in administered territories that the knowledge and skill necessary for this leadership should be centred in the administrations of these territories, with growing emphasis on the transfer of administrative authority to local inhabitants. It follows that this leadership will come mainly from the administrations but it must be designed, perhaps with a greater use of bodies such as local councils and village meetings, in such a way as to avoid the tendency towards over-reliance on continued leadership or "follow-the-leadership" but rather to promote the creation of individual or collective initiative for the maintenance and extension of existing standards.

# Handicrafts of the Trust Territory of the Pacific Islands

By Robert E. McKnight*

*The scattered islands of Micronesia cover an area of the Western Pacific Ocean slightly larger than Australia or the United States, but with a total land area considerably smaller than some of the world's larger cities. The Trust Territory of the Pacific Islands, administered by the United States Department of the Interior, includes all of Micronesia except for the group located east and south of the Trust Territory, known as the Gilbert Islands. While Micronesia can be differentiated culturally from neighbouring societies on all sides, the internal composition of Micronesian culture is quite varied. This is strikingly evident in the area of folk arts as they are expressed in contemporary handicrafts.*

THE HIGH islands, particularly Yap and Palau of the Western Carolines, are characterized by an art background stressing heavy and colourful decoration of public buildings in red and yellow ochre and black and white dyes mixed with a composition of Para nut oil and lime. These colours, in the pictorial expression of multitudinous legends and semi-historical episodes, formed the chief decoration of the Palauan *bai* (club or council house) on gables and rafters, and were applied to post statuary decorating the more prominent canoe-sheds. Geometrical patterns or flat paint coverings were applied, usually in deep red ochre, both to clay and wood bowls in Palau, and repetitive white on black drawings were once found on the gable bordering boards throughout Palau, Yap, and the low islands of the Carolines.

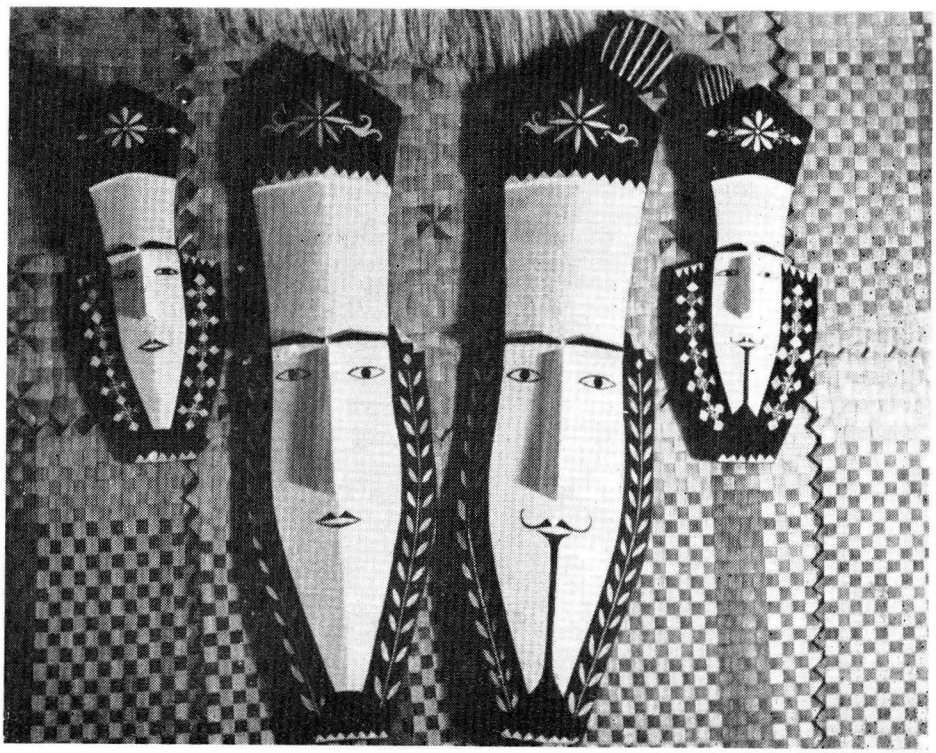
Shell-inlay work, again utilizing Para oil and red-ochre paint in conjunction with mother-of-pearl shell, was characteristic of the high art of Palau and some excellent examples are on display in European museums. One of the finest pieces in this tradition is a great bird bowl, festooned comprehensively with shell inlay, which was presented to Captain Wilson who wrecked an East India Company ship, the *Antelope*, on a reef at Palau in 1783. Covered bowls, cylindrical money containers, coconut candy jars, and ceremonial knives appear to have been part of the traditional media for elaborate shell-inlay work. Currently, following a somewhat changed technology no longer involving red-ochre paints, Palauan craftsmen produce a variety of bowls and jars with shell neatly embedded in a natural wood finish. Shell inlay also performs the service of eyes on statuary and is found as secondary pattern work on a variety of other contemporary items of woodcraft.

### Wood-carving Techniques

Thus the western area of the Trust Territory of the Pacific Islands tends toward woodcraft, much of it rendered in the hard, dark red *dort* (Palauan) or *ifel* (Guamanian) wood. Among the most prominent items that may be listed are the Palauan story-board, the Tobi and Ulithi monkey men, the *bai* (miniature models of solid club houses, also from Palau), and representative statuary depicting the Yapese warrior, the Palauan woman with the tools of her garden, and the mother nursing her child, amongst hundreds of other themes.

Wood-carving throughout the western islands of the Trust Territory is a lively and inventive craft. Even the monkey man, which began its career as a small statuette placed in a canoe along with the deceased as a guardian, in this island form of sea burial, was never apparently intended to conform to a rigid shape or style. One would imagine that early craftsmen varied in skill and art expression among each other, and that the individual craftsman also sought to find some particular expression or mood in

The Mortlock "devil's masks," used in the past in ritual dancing to ward off natural disasters, or sometimes hung on the posts of god-houses or canoe-sheds. The form of the masks is believed by some to be associated with a mask-making tradition traceable back to Indian or Chinese sources.



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each of his creations. At least such is the case today.

A Tobi craftsman will turn out several monkey men following a particular theme (a highly satisfying phenomenon for one who has experienced marketing the objects), but will suddenly tire of this theme and try a new expression, pose or mood. One well-carved monkey man even turned up with a U.S. Army peaked cap on his grotesque head. Another inventive streak recently found expression in Yap, where a group of young students from the low Western Caroline Islands turned their skills in carving to the production of excellent, highly-polished deep-red wood replicas of a variety of sea fish.

### Basketry and Weaving

Though basketry and hand weaving are known and practised throughout the Trust Territory, the acknowledged home of baskets, handbags, and a variety of other woven fibre products are the many atolls of the Marshall Islands. Although the technique may have been traditional only to Kusaie, near Ponape, the best known product in this field is the so-called Kili bag. Fashioned from the white-bleached fibres found only in the youngest shoots of the coconut palm, the tight (almost waterproof) weave is among the most attractive and durable in the South Pacific. Invariably not dyed, the product is always chalk white and, when the weave is applied to hats, has an effect like that of a fine Panama.

Current innovations applied to weaving in the Marshalls are hot-plate pads, and woven flowers which may be used for a variety of decorations and in dry flower arrangements. One inventive young lady found that a proper size of white Kili bag, adorned with a bright woven flower, could be transformed into a remarkably stylish hat.

Woven lava-lava are made throughout the low atoll islands of the Central Carolines, surrounding Truk and extending toward Yap. Fashioned both as everyday wear and as items for presentation to high-ranking island chiefs, one can take one's choice between severe lava-lava with broad black and white stripes, or lava-lava that are adorned with the most intricate patterns in a variety of dyes. This art has been decidedly on the wane over the last few decades and an effort is being made through projects at a community level to seek a revival of home weaving in plantain and pandanus fibres through the introduction of the faster hand looms of western manufacture.

A quick glance across the many islands reveals the Mortlocks, a large group of islands lying south of Truk, with another prominent and successful item of contemporary craft which has survived out of a long traditional usage. This is the Mortlock "devil's mask." Generally, these masks, which range in size from about ten inches to six and seven feet, are done with severe white and black paints in highly detailed patterns, making extensive use of repetitive and geometric formulas for borders. The general art style finds expression in an entirely different media on Ponape where the same general carving techniques—almost an inlaying of white paint on a black or brown surface—are applied to decorative dance paddles.

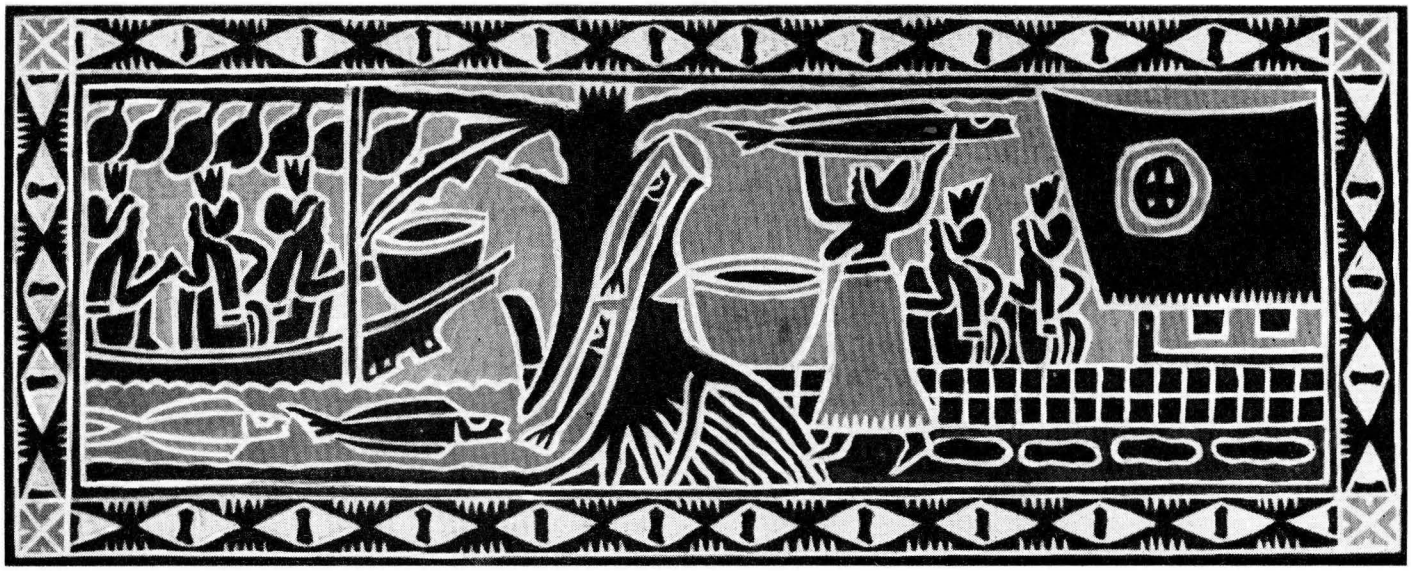
One of the Ulithi monkey-men, carved in hard wood and with shell inlay. These little figures were originally made to serve as guardian companions for the dead when they were set adrift at sea in a canoe.

A total list of items, ranging from turtle-shell craft to an occasional shell adze, which occasionally find their way to market in the Trust Territory, would occupy over twelve closely-printed pages. It is possible here, however, to elaborate on some items peculiar to the Trust Territory of the Pacific Islands, in terms of their background in custom and history of development as a manufactured item of handicraft.

### Palauan Story-board

The Palauan story-board first gained recognition outside Palau when early Europeans sawed out the beams of Palauan council and club houses and crated them up for display in European trading companies and academic museums. (The destruction of these buildings conformed to the broader purposes of the time in detracting from the influence of native village clubs.) This destructive and impractical means of propagating oceanic art appears to have been terminated during the period of Japanese administration of the then League of Nations mandate.

At that time, a Japanese student of



**This story-board illustrates the legend of Milad, the mythological grand-daughter of Latmikiak. Milad, who lived on the reef islet of Ngibtal, off Babelthuap Island, possessed a magic breadfruit tree with a hollow trunk that reached down into the ocean. Once in a while a large wave forced up through the trunk a large fish which provided food for the whole village. In time, however, the people became jealous, and cut down Milad's magic tree with their clam-shell axes. The ocean poured out through the severed hollow trunk and flooded the island, which sank into the sea, where, it is said, it may be seen lying in clear water to this day.**

folklore, by the name of Hijikata, was more or less freelancing in Palau, studying the pottery, the stone imagery, and the kinship structure, as well as other forms of art and folklore. Perhaps as a formal programme under the Japanese administration, Hijikata, himself a masterful woodcraftsman, gathered around him about twenty young Palauan men and taught them not only their own forms of woodcraft (applied both to board and statuary carving) but also their own folklore, which could now make its appearance not only as a permanent decoration on the rafters and gables of public buildings of Palau, but also on the more portable and marketable story-board.

Hijikata was a "purist," insisting that his students adhere rigidly to the simple lines and local paint substances of the traditional medium. Boards produced under his direction could quite literally be mistaken for a slice from the original *bai* rafters. Interestingly, Hijikata, now an elderly gentleman living in Japan, continues to produce woodprints and cards in the art style that he taught in Palau.

After World War II, portable rafter carving was rediscovered along with the craftsmen, and the art and technology of story-board carving began to evolve within the atmosphere of a very favourable market. Under sales pressure, the tedious production of traditional paints was dropped in favour of commercial enamels, the boards took on a brighter appearance in order to appeal to the larger buying public, and the craftsmen, whilst experimenting, began to express individuality. One major innovation was the carving of hard woods to produce attractive natural-colour boards in deep relief. This technique, in the hands of a few craftsmen who had learned cabinet making, was then applied to the ornate Palauan coffee table with story-board themes applied to the surface, and to the boards edging the table, with stylized statuary for legs.

Story-boards may be purchased in sizes ranging from about 6 inches x 14 inches to lengths of several feet. As a rule, the dark, natural wood boards with deep carving tend to carry a higher price. Natural-finish boards cost about a third more for equivalent sizes and workmanship. However, quality and the name of the artist play a determining part in the price for this type of board.

### Mask-making

The Mortlock "devil's mask" is, according to some authorities, an art form associated with a mask-making tradition which can be traced through Indonesia to an early Indian tradition, or even to a late Chou tradition in China around 600 B.C. In the Mortlock usage, the masks may be hung on the posts of god-houses or canoe-sheds, but other uses are mentioned. One, recalled by elders, is the use of the mask in dances apparently designed to acquaint young men with the power of the spirit world; another mentioned by some authors is the use of the mask by men dancing on the beach to ward off typhoons.

The masks are either "male" or "female"; the male masks are adorned with hair ornaments. The general style is quite rigid, always with a squared, flat (or only slightly rounded) head, and pointed chin. Colour is generally black and white, though red detail may be used. The face is typically surrounded by a repetitive, geometric border design. Eyebrows usually receive a stylized "seagull" treatment, and a similarly-styled moustache may be present. Sizes range from small ten-inch masks to masks four and five feet tall.

### Tobi and Ulithi "Monkey Men"

The Tobi Island monkey men, as mentioned earlier, served originally as guardian companions for the dead when they were set adrift at sea in a canoe. Some authors suggest other traditional meanings in the belief that the little statuette represented some form of ancestor spirit. Apparently a similar tradition characterized most of the Central and Eastern Caroline Islands, at least in so far as scattered examples of small statuary, differently styled, can be found from Tobi up through Ulithi and over, and easterly as far as the outer islands of Ponape.

The little men seem first to have caught the commercial interest of German traders at Tobi, perhaps as early as 1860, and have experienced gradually wider recognition ever since. Prior to World War II, the form was encouraged at Tobi as a commercial item, and copied in Palau both by Tobi migrants and by Palauan craftsmen. If made in Tobi,

the wood is always either breadfruit or a wood with dark and very light-brown streaks, somewhat resembling the Hawaiian monkey pod. In Palau the craftsmen often use the dark brown and very hard *dort*. Characteristically, the statuette is severely naked, to the point of lacking detail; the face is triangular with a sharply diminishing forehead from which the name derives. Posture varies greatly, but is often a stylized squat. The grotesque is not unusual; one form has a large round face peering out between high pointed knees.

The Ulithi monkey man is probably a product of the same tradition as the Tobi guardian spirit. A highly-angular style and squat posture is rigidly followed. Production of the statuettes for commercial purposes was not initiated until shortly before World War II.

Navigation charts from the Marshall Islands have received sufficient prominence to be mentioned in any modern text about navigational techniques in the Pacific area. Constructed of thin strips of wood tied together in many patterns, and with shells mounted irregularly to represent land features, the charts depict ocean waves and current characteristics for a given area of the Marshall Islands.

Craftsmen seldom deviate for the sake of aesthetic design from true charts, and as a result, the sticks and shells often have a pleasingly random appearance. At the same time the prices of the true charts suggest the cumulative knowledge that has been invested in them rather than craftsmanship itself. A typical chart covers about two by three feet of wall space.

### Dance Paddles and War Clubs

Dance paddles and war clubs or fighting sticks were characteristic of all the societies comprising Micronesia, but are now characteristically produced at Ponape. Two styles most commonly seen in dance paddles are those of Palau and Ponape. In Palau the paddle itself is about two and a half feet long, with the blade in the shape of an elongated diamond. The flats of the blade are painted with fierce faces representing various village heroes and warriors. Whilst occasionally available locally, these paddles have not been produced specifically for sale; rather, they may become "excess" following a dance.

In Ponape, on the other hand, dance paddles in various sizes have been produced for sale for several years. The style is exceedingly different from that in Palau, with white line designs of an intricate geometric pattern on black or brown covering the flat of the blade. The edge of the blade is attractively decorated with tufts of pandanus fibre, usually white but sometimes dyed in varied colours.

War clubs from Ponape and occasionally Truk are fearsome devices with sharp "bull horn" barbs extending from the flat of the blade at regular intervals. With the possible exception of an occasional museum piece constructed with a blade of sharks' teeth, this design is the most exotic and intricate in Micronesia. They are produced both as a miniature (twelve inches) and in full size (about four feet).

### Love Sticks

Love sticks are a product of the Truk District, particularly Truk Atoll itself. Highly individualized, necessitated by their function, the sticks follow two overall patterns. The most common type is about four feet long and one-quarter inch square, with highly-detailed black and yellow geometric designs from the point nearly to the base. A second type is typically about two and a half feet long, flat, and about three quarters of an inch wide with carved detail in natural hard wood.

Each stick, traditionally, was the "calling card" of a particular male and could be used to rouse a sweetheart by pushing the point through the thatch wall by her sleeping mat. The recipient of the stick could then feel the pattern of carving on the stick and identify the suitor. If he proved acceptable, she would draw the stick into the house. If not, she would push it out through the thatch.

One of the Truk "love sticks," used in a sense as a "visiting card" by a young man when calling on his beloved at night

Mr. Cedric E. Gardiner

### TEMPORARY BIO-STATISTICIAN

Mr. Cedric E. Gardiner, recently appointed as temporary Bio-statistician to the South Pacific Commission, was from 1924-47 in charge of the Vital Statistics Branch of the New Zealand Department of Statistics. In this capacity he was responsible for all official vital and health statistics, and he prepared a number of papers on demographic and health matters.

From 1948-63, Mr. Gardiner was Medical Statistician with the New Zealand Department of Health. His work in this period included the production of annual reports on medical and mental health statistics, and special reports on various other subjects, including *Carcinoma of the Cervix; Cancer Mortality and Morbidity; Needs of Elderly Patients in Public Hospitals;* and *Smoking by School-children in New Zealand.* Mr. Gardiner also compiled the *New Zealand Classification of Diseases for Statistical Purposes.*

During the years 1951-63, he was also a member of the WHO Expert Committee on Health Statistics and attended the Fiji Training Course in 1962 as a consultant. In this period too, he also acted as a lecturer to the Otago University Medical School, Dunedin; the Nurses' Post-graduate School, Wellington; the Health Inspectors' Training Course; and to the New Zealand Hospital Officers' Association.

# Energy Utilization by New Guineans

## Social and Economic Significance

By Dr. Eben H. Hipsley*

*Research work on nutrition, carried out for some years by the South Pacific Commission, showed that there were communities (particularly in New Guinea), where the standard of health was satisfactory although the calorie intake of the population was, according to physiological standards accepted by Western experts, below the basic minimum intake. In view of the importance of this discovery, the Commission asked Dr. Hipsley, Medical Officer-in-charge, Nutrition Section, Australian Institute of Anatomy, Canberra, to undertake a detailed survey among the population of the Chimbu Valley in Papua and New Guinea. Dr. Hipsley's very interesting report will be published shortly by the Commission.*

ENERGY can be defined as the capacity for doing work.

In order to understand "energy" it has to be thought of in a number of ways—

(i) Bodies in motion are said to have kinetic energy. This energy of motion is transformed into other forms of energy when the motion is arrested. For example, a hammer blow has kinetic energy which is released as heat and strain when it strikes a nail.

(ii) Energy due to position or strain. This is known as potential energy. A boulder standing at the top of a steep slope has potential energy. This energy appears as kinetic energy as the stone rolls down the slope. A stretched elastic or a spring band has potential energy in it due to a condition of strain induced in the rubber or steel molecules. This energy is changed to kinetic energy when the rubber or steel resumes its stable shape (i.e. its position of less strain). The potential "chemical energy" present in substances such as sugar, fat, or petrol is due to the position of the individual atoms in relation to each other. This energy can be released when, with the aid of oxygen, the "strained positions" of the atoms are changed to "positions of less strain."

(iii) All forms of energy are ultimately converted into heat energy. This is a property of the atom itself, and all forms of energy can be expressed in terms of equivalent heat units.

Energy can neither be created nor destroyed. If a lump of putty is squeezed, work is performed. The energy expended by the muscular contraction of your grip is transformed into heat, and the putty becomes hotter to a degree exactly equivalent to the amount of work done. The energy of wind is due to the mass of molecules of air moving with velocity in one direction (kinetic energy). When these moving molecules are stopped by a boat's sail the energy is transmitted to the hull of a boat by a system of levers and resistances. The movement of the boat's hull causes turbulence of the water, and when the last ripple ceases, the water has become a little hotter and all the energy transmitted by the sail has appeared as heat —except for a small proportion of the energy represented by the motion of the boat.

Excluding the modern use of atomic energy, all the energy used by living objects on the earth is derived from the sun by means of electromagnetic waves, heat, light, etc. Some of this energy is trapped by the green pigment, chlorophyll, and stored as energy-rich chemical compounds. This energy-rich food may be used by animals, bacteria, etc., or it may be processed further by physical agents to form coal, oil, etc. Some of the electromagnetic radiations from the sun heat the air and evaporate water to form wind and rain.

### History of Man's Use of Energy

It is customary to classify man's cultural evolution in terms of the tools he has used. For example, the first hand tools were probably bones which were used about 1½ million years ago by the *Australopithecine* of Africa. These were followed by stone tools, bronze and iron tools, and finally by the elaborate tools of the modern technological age.

### Tool as a Device

A tool is really a device for directing the application of energy. For example, a knife drawn across the flesh concentrates the energy of the muscles of the arm and hand into a very narrow line resulting in a cut; a spear concentrates the energy of the arm and body into one point which is given direction and velocity resulting in a puncture; in slowly drawing a bow, energy is accumulated in the strain of the bow which on release results in an instantaneous discharge of energy into the movement of the arrow. When it strikes its target a good deal of this energy is again released instantaneously in one way or another; but it finally ends up as heat.

I believe we can get a better perspective of history and of the position we now occupy in it, if we look at history in terms of man's use of energy.

Ages ago, the only energy that mankind could deliberately use in his service was the chemical energy present in foodstuffs which were burnt to enable him to walk about and to keep him warm. To a lesser extent he used external sources of energy by warming his body in the sunlight and by utilizing the energy from accidental fires. His only tools were his limbs and teeth.

### First Use of Energy

The first deliberate use of energy from a source outside his own body may have occurred when a man rolled a boulder down a slope into a herd of game. Later on he discovered that he could make a fire to keep himself warm, and to make his food more palatable. This innovation must have greatly extended his range of environment, and thus widened the choices open to him.

When man learnt how to dominate or organize some of his fellow-men, and to use their physical energy in his own service, he again extended the range of his environment and his scope of choices. The same type of results followed from his taming of beasts of burden, and, in fact, the domestication of other grazing animals, since these can be looked on as instruments for harvesting the energy of grasses and leaves and storing it in meat, fat, milk, hides, and wool.

But the use of forms of energy derived from the activities of living beings (animate energy) was not very great compared with sources of energy that have been exploited by Western man. Nevertheless, with the exception of fire, and the limited use of wind-power for sailing vessels, and water-power, animate energy was sufficient to build the great civilizations of history up to very recent

* Medical Officer, in charge of Nutrition Section, Commonwealth Department of Health, Australian Institute of Anatomy, Canberra.

times. However, the big increase in man's use of energy came in the 18th and 19th centuries with the exploitation of the fossil fuels, coal, and especially oil.

What distinguishes Europeans most markedly from New Guineans is not dietary pattern or physical characteristics, but the amounts of energy used by Europeans. Let us look at this statement from a quantitative point of view.

### Work Units

When the steam engine was invented and put into service, engineers who designed the new power units needed to relate the power output of their new engines to traditional power units. Since the horse was then the most powerful unit of industrial power, it was natural that the work output of the new engines should be related to the work output of a horse. It was estimated that a good horse could lift 550 lbs. (about a quarter of a ton to a height of 1 foot in 1 second; or 1 ton a height of 15 feet in 1 minute).

An athlete, when exerting himself to the utmost over a period of one minute, can do work at the rate of about a half horse-power, but he can perform sustained work at the rate of only about one-twentieth horse-power. Therefore, 1 H.P. represents the work equivalent of about 20 men. When a car developing 50 H.P. is driven at top speed, the rate of work is equivalent to the labour of about 1,000 men. A farmer ploughing his field with the aid of a tractor is employing the equivalent of many thousands of "energy slaves," who, moreover, require no rest periods. This energy can be controlled almost as easily as pushing a button.

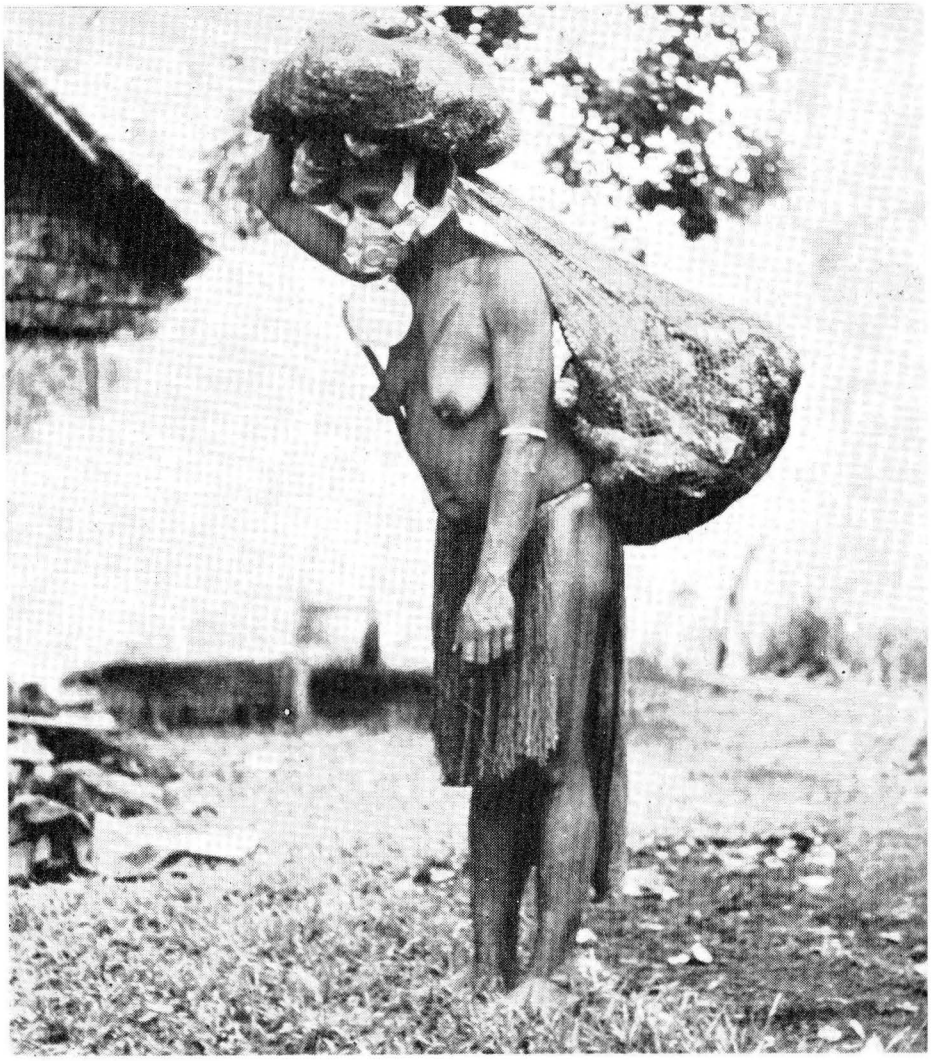
### Energy Function of Food

One of the functions of food is to provide energy for the body. This energy is used by the body for its heat and for performing work.

A man eats an amount of food equivalent to about 3,000 calories of heat energy per day. This amount of energy would be contained in less than 1 lb. of butter. Approximately 3,000 calories is the amount of heat required to boil 8 gallons of tap water. Theoretically, 3,000 calories represent an amount of energy equivalent to lifting 1,000 lbs. to a height of 9,000 feet. However, in practice, even under ideal circumstances, only about one-quarter of the energy value of the food appears as work. Most of the energy used by the body appears as heat which is dissipated from the body in various ways.

### New Guinea Study

During 1962 an attempt was made to find out more about the energy value of the diets of New Guineans, and the ways in which this energy was accounted for in their daily lives. The methods of this investigation were to observe and record all the food eaten by a person. By using tables showing the energy value of these foods, the energy value of the diet was computed. The physical activities were observed and recorded, and the rate at which energy was used in an activity such as gardening was measured by means of a special instrument. (See illustration.) With this information a scale could be drawn up. Theoretically, any credit balance of energy representing excess of input over output would be represented by gain in body fat, and any debit balance would be represented by loss of body fat. These results are to be published by the South Pacific Commission as a monograph (authors Hipsley and Kirk). It is not my purpose here to write much about this aspect of energy utilization by New Guineans, except to say that it is likely and that consequently they probably exsume less food energy than Australians, and that consequently they probably expend less enery in muscular action and in body heat. However, at intervals, their rate of energy expenditure would be quite high—probably higher than the rate that would be expended by the average Australian. This may have important implications with regard to physical fitness and the pattern of heart diseases in Australians.



A woman returning from her garden with a load of sweet potatoes, and wearing metabolism apparatus used to measure rate of energy expenditure.

My present purpose is to give some idea of the extent of the non-food utilization of energy by New Guineans (i.e. their use of energy other than manifested by the work of their own bodies), to show why it follows the present pattern, and indicate whether it is likely that this may change.

### Non-food Utilization of Energy by New Guineans

Almost the only non-food energy put to use by the New Guineans is firewood. This is used in cooking, in heating the houses, and is often used in garden-clearing operations.

Wind-power is used in some places along the coast to propel boats, but even in this case man-power is frequently needed when the wind is unfavourable or fails.

Beasts of burden are not used by New Guineans, and the only domesticated animal which forages for itself is the pig. In general, one can say that firewood is the only source of non-human energy used by them. There are no prime movers other than man's own muscle power. This situation is substantially true even in areas that have long been in contact with Europeans.

The large production of goods in Australia and other so-called "developed" countries is only made possible by the widespread successful application of non-human energy. This increased use of non-human energy must somewhere and somehow be applied to a "food-producing activity" because a sufficient amount of food is essential to life. When people can be freed from the necessity of engaging in food production, they can undertake other enterprises.

It follows that for overall productivity to increase very appreciably in New Guinea, more non-human energy sources would need to be employed in food production (and distribution). The only possible alternative is to feed a "non-food producing work-force" by means of imported foods. This could only be possible if this work-force was small or if the total economy could create a sufficiently healthy and stable export trade to import large amounts of food in addition to other essential imports. There is no immediate prospect of this possibility in sight. Therefore one must consider the prospects for the employment of more "inanimate energy" in food production.

By "inanimate energy" in this context, is meant not only the internal-combustion engine, but also electricity generated by water-power.

There are two natural difficulties in the way of employing more inanimate energy in much of the agricultural areas of New Guinea. These are climate and terrain.

### Climate

Generally speaking, the climate is hot and moist; it hinders the use of more non-human energy in many ways—particularly when the climate is considered in relation to terrain.

### Terrain

The New Guinean terrain is broken by great mountain ranges and intersected by rivers, both of which often pose nearly impassable barriers. On the coastal plains these rivers spread out into vast swamps. Agricultural land with slopes of less than 30° is very limited.

The use of the internal-combustion engine, or even the employment of draught animals, is not possible on these steep slopes. Great damage to the land can easily occur if farming methods suitable to temperate climates and to less mountainous terrains are applied.

Climate and terrain combine to make communications and transport by means of motorized vehicles very difficult to establish and maintain. Administration, including health and education services, would be impossible to maintain on the present scale without the aid of the aeroplane, but aerial transport cannot serve industries except the very light and the very specialized ones.

*(Continued on page 50)*

**Rugged terrain found in the highlands of New Guinea makes communications and transport difficult**

# Improving Nutrition at the Village Level

By Hortensia de Hollanda*

*This topic was the subject of a Seminar convened by the World Health Organization Regional Office for the Western Pacific, held in Manila from 20th to 30th January, 1964. Mme. de Hollanda attended this meeting as the SPC observer.*

PARTICIPANTS from 19 different countries and territories, observers from official organizations, and the WHO consultants who attended, studied in a friendly and informal atmosphere the actual situations and programmes of nutrition and community development.

In particular, attention was directed towards both the close relationship between nutritional standards and the occurrence of disease, and the indices of infant mortality and the general level of health of the communities. The establishment of nutrition sections within departments of health was unequivocally justified.

The Seminar emphasized that, ideally, each administration should have an organization devoted to making sure that all sections of the community partake of adequate amounts of the right kinds of food. Without such an organization, malnutrition—most frequently revealed by increased susceptibility to disease—is very likely to arise.

Nutrition work at this level involves co-operation between the various departments of health, economics, agriculture, community development, and others concerned with the higher levels of the formulation of national policies. These policies may be directly aimed at ensuring adequate nutrition of the native people.

However, the implementation of even the best policies of large developmental schemes will depend to some extent upon the activities carried out in small communities. It is important to work at the village level as a necessary part of the broader, national project. Such enterprises, even in the absence of high-level directive schemes, are essential to improve local standards of health through better nutrition.

### Problems

Accounts from people involved in such programmes revealed many problems and how they have been met. Some important aspects of the work at the village level were pointed out and discussed. These included—

(i) The importance of cultural conditioning in feeding patterns. Wherever the action programme failed to approach the problem of food as a cultural problem, e.g. in its intimate relationship with the different aspects of life—religious and social, as well as economic—unsatisfactory results are to be expected.

(ii) As we are generally dealing with people, we must deal with their whole welfare, not only with their nutrition or their health. Field projects usually showed a tendency to be confined to somewhat narrow fields of activities. But a programme designed to improve health, especially through better nutrition, must involve itself with every aspect of the communal life to have meaning to the people and to get them to want these benefits.

(iii) If nutrition projects are to be successful, very careful planning must be made both from the points of view of technology and of community development. For instance, in areas where inadequate nutrition is common, food supplies are generally limited, especially in variety. It is therefore not usually possible to teach people in these areas to make use of a variety of foodstuffs available to more prosperous communities. In such areas, teaching for better nutrition can only have a positive impact on the people when it is based on the use of the kinds of foods already available or which could relatively easily be produced locally. This evidently requires a basic knowledge of the composition of the local foods and subsequent planning of diets based on local resources.

In this connexion, Dr. G. R. Wadsworth, WHO Consultant from the University of London, reviewed for the benefit of participants at the Seminar some of the latest developments in nutrition. Recent nutrition theory based on protein requirements[1] has led to the elaboration of recipes often consisting of a staple food such as rice with the addition of only one or two other foods, as for example, legumes, skimmed milk powder, or eggs. Experiments on which this theory is based show that it is the concentration of protein of the right quality that is the critical factor in determining whether a given diet is adequate. This concentration is necessarily much higher in the case of pregnant and lactating women and small children.

When the proportion of calories provided by an "ideal protein"[2] concentration in the diet falls below 8 per cent, the toddler child living on this mixture will sooner or later suffer varying degrees of protein deficiency. This may only reveal itself by a relatively slow rate of growth, or may develop to an extreme degree in which death may become inevitable. But even in the mildest cases the child is increasingly exposed to the effects of infectious diseases such as enteritis, pneumonia, and measles.

### Subsistence Farming

It was stressed that in any scheme to improve conditions in rural areas, nutrition naturally assumes prominence because of widespread subsistence farming. Any success in raising levels of farming will have an immediate impact on what the people have to eat. An improvement in diet should lead to a greater resistance to disease and therefore an increased ability to attain prosperity.

The Seminar made it evident that the improvement of nutrition at the village level can only be based on sound principles and on methods of community education and development.

Such principles and methods drawn from the behavioural sciences,[3] should be widely and fully employed by both programme and project planners, not only to avoid failures and setbacks but also to create the best conditions for active participation, learning, and intelligent action of groups and individuals.

Finally, it was agreed that the already significant contribution of these sciences towards understanding, predicting, and conditioning adult behaviour should be given more than "lip service" in the selection, training, and orientation of personnel for field projects.

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[1] Human Nutrition Research Unit, National Institute for Medical Research, The Ridgeway, Mill Hill, London.

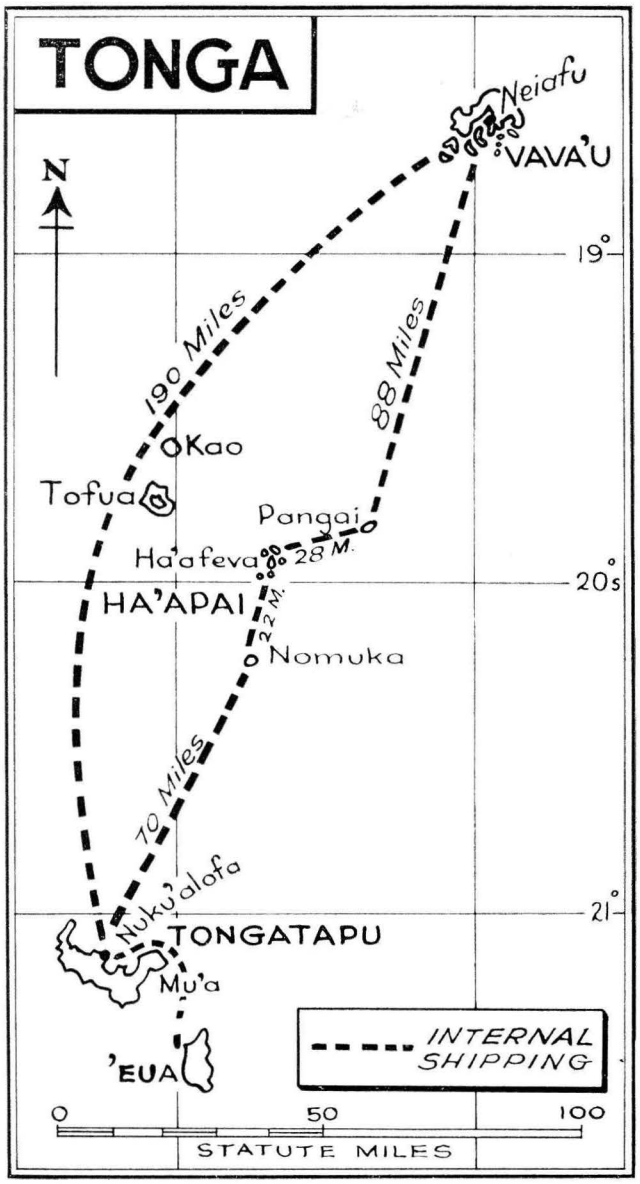
[2] One which contains all essential amino-acids.

[3] A cluster of scientific disciplines, usually thought of as including psychology, psychiatry, sociology, anthropology, social psychology, biology, and, sometimes, economics.

# Urbanization in Nuku'alofa, Tonga

By A. C. Walsh*

*This article is the third in a series on urbanization of South Pacific towns appearing in the* SOUTH PACIFIC BULLETIN. *The first two articles appeared in the October, 1963, and January, 1964, issues respectively. The article below is a preliminary account of Mr. Walsh's work, some parts of which will no doubt need qualification as it proceeds.*




NUKU'ALOFA is situated in Tongatapu, the largest of the three main island groups that make up the Kingdom of Tonga. The population of the Kingdom in 1937 was 32,800, in 1956 it was 56,800, and today it is about 72,000. This increase has not been shared evenly among the island groups of the kingdom: in 1939, 45 per cent of the population resided in Tongatapu, in 1956 this had increased to 55 per cent, and in 1964 it is almost certainly greater. In 1956 nearly one-third of the population of Tongatapu, or 17 per cent of the total population of the kingdom, were living in the capital, Nuku'alofa, whose population has increased from nearly 4,000 in 1937, to 9,200 in 1956, and to about 16,000 at present.

In these figures we can see repeated in Tonga something of the population explosion, the shift to the main islands, and the drift to the main towns which is a common feature of much of modern Polynesia.

Nuku'alofa is not unique in these respects, but it is perhaps unique in that it is totally unprepared to receive any further people. It has no municipal government and consequently no town regulations, no water or drainage schemes, no proper refuse collection, and few additional avenues of employment compared with those it had when the population was half its present size. It is predominantly a town of semi-subsistence agricultural workers, some of whom have their own land, but the majority of whom are squatting on the land of others.

In these respects, Nuku'alofa is not an urban settlement at all; it is an agglomeration of three agricultural villages which, because of a king's decision in 1845, the presence of Wesleyan missionaries, and its natural advantages as a port on the largest island of the group, became at once the capital, the centre of Wesleyan mission activity, and the first port for overseas trade. Its subsequent growth and the merging of its three villages have been the direct result of its three initial functions. It has grown with Tonga and developed few new functions other than those usually associated with administration and trade.

Nuku'alofa extends south from the reef-fronted ocean to an almost land-locked lagoon. It stretches some three and a half miles along the sea front, and is a little over one mile from the sea at its furthest point. It occupies about two square miles of very low-lying land, some parts of which are swamp. Apart from an isolated coral knoll of 60 feet, few parts of the town are over ten feet —and many parts are only inches— above the mean high tide mark.

It is fortunate that the malaria-carrying mosquito is unknown in Tonga. However, dependent as Tonga is, solely on rain and well-water and lacking proper sanitation, the incidence of water-borne diseases is high. Its low relief no doubt

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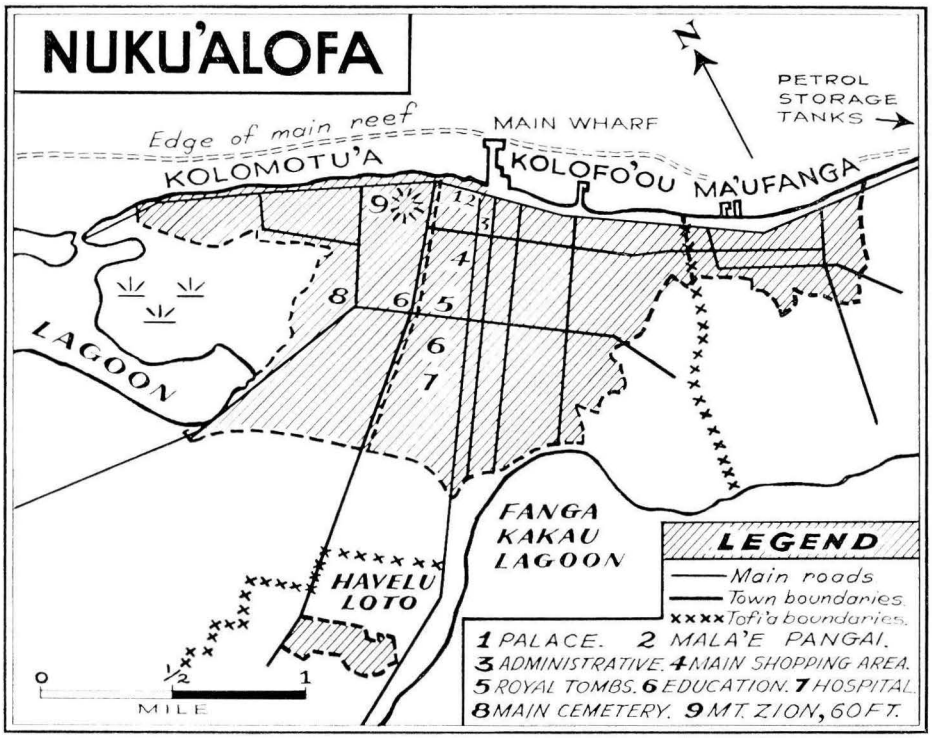



contributes to a high rate of respiratory complaints.[1]

Population density, seven people to the acre in 1956, is now about twelve people to the acre. It should be noted that this is higher than the density of Suva urban area.[2] Almost all of its people are living in village-type conditions and this, coupled with its lack of relief and population density, undoubtedly presents a health hazard.

Other than the Palace, the battery of guns, a monument, and the Norfolk pines that line part of the waterfront, Nuku'alofa presents a squalid appearance to the visitor. Although its roads are well laid-out, neither the administrative or shopping sectors which back on to the main wharf nor the residential sector which extends beyond, has taken full advantage of its systematic road network. The processes of administration are carried out in many inadequate buildings around the Mala'e Pangai (a green or park used for public ceremonies or for the erection of stalls during visits of tourist ships). The shopping area is made up of two overseas trading stores, several local European or part-European-owned stores, and a variety of smaller, less well-kept Tongan-owned stores. In addition to these there are four stores owned by Indians. Almost all the stores are in the one street and almost all are single-storeyed, of varying heights, design, and age. Few of the stores specialize and goods purchased from Tongan-owned stores are usually dearer because they have been purchased at slightly over landed cost from the European stores. On any day except Sunday the sides of the main street are clustered with people selling agricultural produce. On a Saturday these clusters are augmented by villagers who have come to town to sell their produce. For entertainment, the town has three ramshackle theatres and several equally ramshackle billiard saloons and kava saloons or clubs; these clubs are located in the residential area.[3]

The residential area does not display any marked internal differences. Houses built in all forms of construction can be found throughout the town, though recently-built houses of Tongan material are, as would be expected, more dominant at the town boundaries. Few houses take advantage of the road frontage, and are built, apparently at whim, on all parts of the town allotments. Although government houses tend to have been built in groups as soon as land became available in a particular area, a Cabinet Minister or a seconded European living in a large European-styled house frequently has for a neighbour an unemployed in-migrant living in the crudest of thatched houses. Thus, neither class nor cultural differences are reflected in the residential pattern. As will be seen later this is because of the nature of Tongan land tenure.

Unlike all other towns and indeed unlike all other islands in the South Pacific, Nuku'alofa and Tonga are the product of Tongan enterprise, assisted only at certain points by the outside world. There were in 1956 only about 150 European men in Tonga, 60 per cent of them in Nuku'alofa, and the Indians, whose immigration is strictly limited, numbered but a few families. Even in recent years Tonga has received no overseas loans and it is proud—perhaps a little too proud—of its still favourable trade balance.

### The Population

The first adequate census was taken in 1956,[4] but unfortunately much of the material was not analyzed. No special attention was given to urban areas and no census has been taken since.

The Census Officer in 1956 wrote in his report—

> "The Tongan's sense of 'belonging' to his village or island of birth appears sufficiently strong to offset any large-scale movement of population to Tongatapu."

Closer examination of the census revealed, however, that 42% of Nuku'alofa's population was not born there, of these, 11% were born in Ha'apai, 7% in Vava'u, 14% in the rest of Tongatapu and 9% elsewhere. Between 30 and 40% of those born in Vava'u or Ha'apai who were resident in Tongatapu were to be found in Nuku'alofa. Although the in-migrant populations, especially the Tongatapu group, were weighted in the secondary school age groups, the general features of these populations clearly pointed to permanent family movements. Movement was considerably higher from Ha'apai in relation to the size of its population, some villages having resident in Nuku'alofa as great as one-sixth of their village-enumerated population. Movement was greater from the larger settlements but the proportions involved were naturally not as significant to the villages they had left as they were to some of the smaller villages. This was the situation in 1956. Today, some seven and a half years later, the population of Nuku'alofa has increased by 41 per cent. The overwhelming majority of the people causing this increase (some 4,500 by my estimation) are in-migrants. It would seem that the Tongan is fast losing his sense of "belonging." If this rate of inflow continues, the population by 1971 could well exceed 25,000, Nuku'alofa then having some 27% of Tonga's projected population at that date. In all age groups Nuku'alofa had a sex ratio in favour of females. This differed from the national pattern, which was most closely followed by the Ha'apai in-migrants and least by the in-migrants from Tongatapu. The town was under-represented in the under-five age group and in people over 70 years of age. The median age did not differ appreciably

[1] Precise figures for comparison with other parts of Tonga are not yet to hand.

[2] Suva urban area, 4.7 persons per acre. Suva city, 8.8.

[3] In addition, there are three well-established clubs for those who can afford the membership fees.

[4] Unless otherwise stated all figures are based on this census.


**Nuku'alofa—view of the Government buildings taken from a vantage point at the base of Vuna wharf. In the foreground, the central building which houses Customs, the Post Office, and the Treasury. To the left, the Parliament and Court buildings. In the background, to the right, the Premier's Office.**

from the country as a whole, both median ages being under 18—slightly younger than the Fijian median age and over two years younger than the Maori.

Marriage figures showed that a slightly smaller proportion of Nuku'alofa's population was married than was the case in the nation as a whole. It was expected that divorce would be higher in Nuku'alofa. This was true for the women but not for the men. However, as re-marriage is almost certainly easier for men it can be assumed that the difference between male and female divorce rates is not significant. The slightly higher combined divorce rate in Nuku'alofa probably indicates a difference between town and country in the attitude towards marriage. It is probable that people in Nuku'alofa marry later, but no special information was sought on this in the census and deductions from other related information are questionable.

The census figures relating to fertility must also be taken with caution.[5] The proportion of women with no children is greater than in the rest of the kingdom. For interest I have compared the fertility ratios with the New Zealand Maori.[6]

| TONGA | NUKU'ALOFA | MAORI | MAORI |
|---|---|---|---|
| *(Tongans only)* | —— | *All New Zealand* | *Auckland urban area* |
| 156.5 | 126.4 | 173.0 | 111.1 |

The important thing to note is that while influences of urbanization have not affected Nuku'alofa's fertility as much as it has the urban Maori, it has had some effect. Similarly, urbanization has affected the size of the family; the average Tongan family had 5.8 children, the family in Nuku'alofa 5.1 children.

While 58% of Tonga's Europeans and 30% of its part-Europeans were living in the capital, together these amounted to only 3.7% of the town's population. If Samoans, Fijians, Niueans, and all others are added, the non-indigenous population still only accounted for 6.3% of the population. Its homogeneity was the most striking feature, and, in this, Nuku'alofa differs from other Pacific towns.

Nuku'alofa, then, has more females than males, it has lower marriage and higher divorce rates, its fertility pattern is lower and its families are smaller than in the nation as a whole. A large part of its population was not born there and it is these people, joined every year by increasing numbers of fellow-villagers, who are responsible for a growth rate double that of the kingdom as a whole.

### Town and Country Land

Some 45% of the town's adult male population[7] classified themselves as farmers in the 1956 census, and yet over half of those entitled to land by law (this is not quite the same group) were without registered titles. Some of these no doubt had other employment, some were still at school, many shared land with relatives, but some would be called unemployed in any western-type community. To understand this peculiar situation it is necessary to understand something of the system of Tongan land tenure.

Every male over 16 years of age is entitled by law to a life-long lease of 8¼ acres of farmland called *'api 'uta*, and one rood and 24 perches of town land called *'api kolo*. This land is allocated, on condition that poll tax is paid, from the *tofi'a* or estates of the nobles, the government, the Queen, or the Royal family. The whole of Tonga is divided into *tofi'a* which not infrequently cut through parts of the town, dividing it in two. This is the case in Nuku'alofa.

Kolomotu'a and Kolofo'ou[8] (with the exception of the Palace and the Royal Tombs) belong to the government, while Ma'ufanga and Havelu Loto (which is the site of the town's only really secondary industry) belong to nobles. To qualify for the grant of an *'api* an in-migrant must have transferred his registration to Nuku'alofa. Theoretically every male over 16 years of age, paying tax, is entitled to both *'api 'uta* and *'api kolo* in the place in which he is registered.

That this is not so has already been suggested. More precisely, between 50 and 75% of the taxpayers (it varies in different parts of the town) in 1956 had no *'api 'uta* and between 30 and 54% no *'api kolo*. If we remember that the population has increased by 41% we will see that the registration of only 22 new *'api 'uta* since 1956 will have done nothing to ameliorate conditions. This should be sufficient to show that the system, much admired overseas and which has served rural Tonga so well in the past, is certainly not adequate today in meeting the needs of a sizable town with an ever-increasing population. The system of land-holding is an essential part of the framework upon which the whole fabric of Tongan society is built. Radical changes here could well undermine the whole system.

### Town Government

It will not be surprising to learn that a town which was conceived as a com-

[5] I understand that Dr. Norman McArthur, an authority on Pacific demography, has questioned whether any reliable information concerning fertility ratios can be gleaned from the 1956 census.

[6] Fertility ratios—the number of children aged 0-4 to every hundred women aged 25-44. Maori figures: Poole, I, 1961. *Maoris in Auckland. A Population Study*, Journal of the Polynesian Society, 70 : 1, p. 53.

[7] Males aged 20-59 years.

[8] *Kolo* means town; *motu'a* old; and *fo'ou* new.

munity of farmers, and which today is still largely composed of farmers, is also lacking in legal provisions for its administration other than those accorded to every other town or village in Tonga. The only regulation peculiar to Nuku'alofa and the two other large towns (Neiafu in Vava'u, population 2,873, and Pangai-Hihifo in Ha'apai, population 2,803) is that pigs must not be kept within the town boundary! Thus Nuku'alofa is considered as three towns, each of which has a town officer nominated by the government[9] whose main responsibility is to see that government proclamations are carried out. These officers periodically call the taxpayers together for a *fono* or meeting, and it is then that government wishes are communicated to the taxpayers. There is little opportunity for *fono* opinion being communicated to the government. The town officers are also expected to keep a tally of the number of taxpayers in their area and inspect the *'apis* of each taxpayer.

Superimposed on this system is the central government, and bridging the two there is Nuku'alofa's nearest example of municipal administration—the Electric Power Board. Provision has also been made for a Water Board which, like the Electric Power Board, will be an adjunct of the central government. Similar boards have already been formed, on World Health Organization initiative, in villages which have reticulated water. If the yet-to-be-formed Nuku'alofa Water Board assumes some of their organizational procedure it could be a forerunner of municipal government.

### Housing

The table below shows the percentage of houses built with different materials, recorded in the 1956 census—

| | NUKU'ALOFA | TONGA |
|---|---|---|
| European materials | 49.4 | 33.3 |
| Tongan materials | 22.4 | 41.2 |
| European and Tongan materials | 28.2 | 25.5 |

[9] There is talk of making these positions elective.

Understandably, Nuku'alofa has a much higher percentage of houses built entirely or partly of imported materials. Unfortunately the materials with which a house is built give little indication of standards.

I have not progressed far enough in my research on housing to be able to give anything more than a series of impressions, some of which will no doubt need modification as my work proceeds. I include these impressions here because, with the South Pacific Commission's recent "Conference on Low-Cost Housing," attention is currently focused on the housing question.

*Houses of European materials.* The standard of these houses varies considerably. They include houses of corrugated-iron roofs and weatherboard walls, and houses with walls of beaten-out kerosene tins, corrugated iron, or scraps of cut timber. The number of houses using concrete is small, but indications are that its use is increasing. With no agency for lending money, and with no urban building regulations, many of these houses are made from other houses that have been pulled down, and their construction progresses in fits and starts, each start an indication of the availability of money or materials. Houses in varying stages of construction are thus to be seen throughout the town. These houses are generally small, many lack internal partitions or interior lining, almost all are built with family labour, and most have outside kitchens and toilets. External kitchens are also to be seen in the larger examples of houses in this type of construction. This seems to indicate a preference, traditional to much of Polynesia, to keep the living and the eating quarters separate. Most Tongans desire to build a house of European materials, but once built, few of the houses show evidence of being painted and repairs are frequently neglected. Land, of course, costs nothing. This, and the readiness of members of a family to assist in house construction, reduces the costs.

*Houses of Tongan materials.* It is thought that the traditional Tongan *fale* was once larger than its equivalent today; there is also some evidence to suppose that it was raised on a platform of coral similar to the Samoan practice. If these suppositions are correct, the standard of houses built entirely of Tongan materials has declined. It is probable that this decline is even more true of Nuku'alofa, where the demands on coconut leaves must be taxing the local supply severely. Certainly, people are having to travel greater distances for their supply today. The proportion of these houses has increased since 1956, almost certainly because recent in-migrants cannot afford to purchase building materials, largely at the expense of houses built entirely of European materials. None of these houses is raised from the ground; the occupants sleep on layers of mats piled over coconut leaves. It appears likely that the incidence of respiratory complaints is highest in these houses, a large number of which are built in parts of the town where water lies on the ground for several days after heavy rain. Picturesque though they may be, these oval and square-ended houses of Tongan material are today the greatest building challenge in Nuku'alofa.

*Houses of European and Tongan materials.* These houses display every possible combination of the uses of local and imported materials and styles. The most interesting are those which are built almost entirely of European materials but which retain the traditional oval shape. It is doubtful whether such a shape saves either materials or labour, but it does influence the domestic arrangements of the household. Usually *tapa* cloth will be hung down in the evenings to provide two bedrooms, one at each end. The custom of brother-sister avoidance may well be a factor in the retention of this oval shape.

Housing is one thing on which action can be taken. No threat to existing values is involved, the money needed is not beyond Tonga's financial resources, labour costs little, and land nothing. It

**Scenes in shopping centre, Nuku'alofa; with picture theatre featured on the right**

would appear that a building scheme would need to concentrate on providing houses of European materials with some attention given to Tongan living habits, particularly those associated with food, sleep, and the use of the whole *'api* as an extension of the house.

### Employment

It has already been said that some 45% of the male working population was employed in agriculture in 1956. Similar figures for secondary and tertiary employments are as follows—

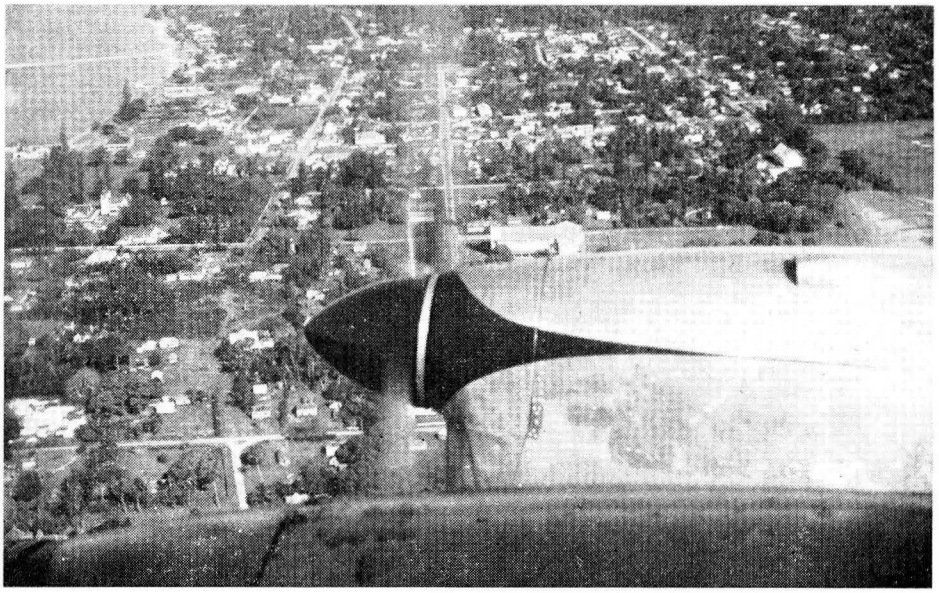
| | PERCENTAGE OF THOSE EMPLOYED IN NUKU'ALOFA | PERCENTAGE OF THOSE EMPLOYED IN TONGA |
|---|---|---|
| Commerce | 5.2 | 22.0 |
| Transport and communication | 9.5 | 64.7 |
| Part-manufacturing and processing | 6.8 | 33.4 |
| Services | 19.9 | 26.0 |
| Commodity Boards | 5.5 | 57.6 |

The figures tend to underestimate Nuku'alofa's contribution to employment. For example, although 22% of those employed in commerce were in Nuku'alofa, few commercial concerns outside Nuku'alofa are significant either in the numbers they employ or the capital they represent. Most would be small, barely economic family stores whose main owner is probably more properly designated a part-time farmer.

The last category, Commodity Boards, consists of the two semi-government enterprises, the Tongan Copra Board and the Tonga Produce Board, which between them have a monopoly of the export of all agricultural produce.[10] The establishment of these boards has permitted an accumulation of capital which already is being used to develop new industries at Havelu Loto. The success of Nuku'alofa in finding employment for its increasing population appears to lie largely in the hands of these two boards. No other body, excepting the government itself, has enough capital to establish industries to accommodate the working population.

It is impossible from the census figures to number accurately the proportion of workers employed directly and indirectly by the government, but an informed guess would be between 25 and 30 per cent. Outside the government, the commodity boards, and three or four of the larger stores, the majority of the town's workers are employed in very small concerns. Industry, such as it is, is mainly small-scale, family-owned, and is more properly called services or servicing than part-manufacturing and processing.

[10] The Tonga Construction Company, a subsidiary of the Copra Board, could also be included here.



**Aerial view of the capital looking east. To the left, clearly distinguishable among the surrounding casuarina trees, stands the Royal Palace.**

### The Causes of Migration

Three things are mainly responsible for the movement of people from the other islands to Tongatapu and Nuku'alofa—pressure on land, the absence of employment and the need for money, and the desire for secondary education.

The pressure on land is spread unevenly throughout the group, but the pressure is greatest in Ha'apai, the average population density of which is nearly 500 people to the square mile. However, there does not appear to be any close correlation between the shortage of land in the various Ha'apai islands and the degree of immigration from them to Nuku'alofa. This is surprising, as almost all those I questioned from Ha'apai during a recent survey gave land as the main cause of movement. Another example of the differences between what men believe to be the causes motivating their actions and the real causes is seen in the low rate of migration to 'Eua, a fertile island of 33 square miles which lies some 20 miles by sea to the south of Tongatapu, and which in 1956 had a population density of only 56 people to the square mile. Similarly, the volcanic islands of Kao and Tofua, to the west of Ha'apai proper, are completely uninhabited. If it is land they want, the spirit of "Go west, young man!" has not yet reached Ha'apai.

More recent research indicates that temporary settlement is becoming significant on Tofua and Kao. There were 162 men on Tofua in 1962 and, according to the ANU scholar, Alaric Maude, they were there largely to collect copra and plant kava for sale. Similarly, the migration of young single men to the island of 'Eua from at least two islands of the Ha'apai group has increased since 1956. It is thought by the present writer that this latter movement is a consequence of the 1961 and 1963 hurricanes, but, notwithstanding this, the movement is likely to lead to permanent settlement.

### Education

Education is a magic word in Tonga. Nearly every household is furnished with certificates of proficiency and diplomas of merit. The fact that education is largely unrelated to life in the villages (and that so few can take advantage of it by gaining employment in the towns) is of little consequence in deterring a family from seeking the best possible education for its children. Nearly all the secondary schools are in Tongatapu, five of them in Nuku'alofa. Education acts as an attraction not only as far as the children are concerned, but it attracts their mothers to look after them, their younger brothers and sisters who also need to be cared for and, not quite so often, their fathers who need to find employment to pay for their children's education. Frequently this family movement is intended to be temporary, but as the elder children complete their education, the younger children commence theirs. When the eldest daughter gives birth to a grandchild the "point of no return" has usually been reached. The extent to which secondary education influences migration is reflected in the primary schools, some of which have closed their rolls to children who are not genuine residents of Nuku'alofa. The presence of a large girls' secondary school in Nuku'alofa (and the tendency for mothers rather than fathers to accompany their children) is undoubtedly a factor in the presence of Nuku'alofa of more females than males.

Money is an essential part of every Tongan's life. It is needed for education,

for the imported articles that have become an essential part of Tongan living standards, and for the churches perhaps more than for any other single item. High copra prices after the war, followed by today's lowered prices and three serious hurricans, have no doubt been responsible both for increasing the Tongan's demand for money and at the same time decreasing his ability to earn it. However, it would be misleading to think of the Tongan as an acquisitive being. Once the basic requirements have been met, few desire anything more. Nuku'alofa may not offer secure employment to many, but almost alone of all the towns of Tonga it does offer the opportunities for casual work and the sale of vegetables and hand-made articles. The small sum thus earned guarantees the minimum requirements of the average in-migrant. I think it safe to say that the need for money is the main single cause of migration to Nuku'alofa.

### The Pattern of Migration

Without a regular job, without land of his own, the in-migrant could not survive in Nuku'alofa but for his being able to rely on other established members of the same kin group. It is to them that he goes on arrival, it is on their land or in their house that he has his residence, and it is on their *'api 'utu* that he grows his own food crops and perhaps his vegetables for sale.

Improved transport, low fares, and the opportunity of staying with relatives at no charge make migration possible for many; increased needs, lowered earning capacities, and an increasing population on limited land resources provide the need for and the hope of some kind of employment. Secondary education, and the belief that there is land available for use if not for registered lease, provide the incentive. There are, of course, other factors, and all factors overlap; but this for what it is worth, is an attempt to establish a hierarchy of causes.

No great adjustment is required from the in-migrant on his arrival in town. Kava, *tapa* making, the church choir, periodic feasts, and *umu* food are all as much a part of town-living as in the village just left. Nuku'alofa is essentially a town of village thinkers confronted with emergent urban problems.

### What Should Be Done?

So far, many of the emergent urban problems of Nuku'alofa have been concealed by the advantages of a generally favourable climate and cushioned by the ramifications of still-strong kin obligations. Obviously this should not stop attention being given immediately to measures that can improve standards and cater for the migrants who are still to come. The following lines of approach suggest themselves—

(i) The authorities need to recognize that new and special problems are emerging in Nuku'alofa because it is a town, albeit a town with many (at present necessary) rural appendages. My work is beginning to suggest lines where detailed research is necessary. Certainly the intention of having another census in 1966 is absolutely essential. Special attention should be given to the questions asked in this census which relate to larger towns. The results of the census should be analyzed. The last census cost a bare £1,600. This is not cheap if it is not analyzed in detail and if action does not follow from its recommendations.

(ii) Within the town there are, I consider, three priorities—the development of some sort of town council composed of technical people and representatives of the taxpayers; the provision of low-cost housing; and the acceptance of outside assistance to provide reticulated water and proper sewerage and drainage facilities.

(iii) More generally, the government must continue to consider the possible ways of providing employment, and also turn its attention to ways of removing or ameliorating some of the causes of migration from the other islands. Neither is easy—Tonga has few natural resources beyond agriculture, and these are not shared evenly among the many islands of the group.

Like most of Polynesia, the Kingdom of Tonga is confronted with a rapidly increasing population and very limited resources to accommodate it. Probably nowhere are the results of this better seen than in the capital, Nuku'alofa.

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## Energy Utilization by New Guineans

*(Continued from page 43)*

### Economic Pattern

The two factors of climate and terrain have largely determined the basic economic pattern. This comprises self-contained, isolated villages, claiming an area of surrounding territory from which the people derive all their needs. The agricultural system is known as "bush fallow rotation." An area of bush is cleared, mixtures of crops are planted and harvested for a period of about two years, after which the bush is allowed to grow for a period varying from 5 to 15 years, depending on the nature of the soil and the pressure of the population. Since only about one-quarter to one-eighth of the agricultural land is ever under cultivation, one gets the impression that there exists a good deal of unused land, but this impression does not always survive closer scrutiny.

The introduction of the steel axe to replace the traditional one of stone resulted in a substantial saving in the amount of labour needed to maintain life in the villages. This was especially true in the case of men who were the main users of axes. Before the introduction of the steel axe, virtually every adult was directly engaged in food production. Even today, all the women and probably over 80 per cent of the men are still so engaged. When this picture is compared with the 13 per cent of the agricultural work force in the U.S.A.—and taking into account the fact that women in the U.S.A. are in general not productively employed in this activity, and also the fact that a large surplus of food is produced for export and for manufacture into non-food items—the difference becomes very striking.

Although there appears to be little immediate likelihood that more "inanimate energy slaves" will be used in the rural food-producing and transport industries, there is one factor to be noted. This is the vast amount of water-power available throughout New Guinea for the production of electrical energy. The problem is to find economic uses for it. It must be regarded, however, as one of the "white hopes" for the economic development of New Guinea in the future, particularly for the export of products that require a large amount of electrical energy in their manufacture.

### Is Economic Growth Desirable?

I have written about energy and the New Guinean in relation to economic development (increased production of goods). I have said that economic development is largely dependent on man's use of non-human energy. It might be assumed by some people that I am implying that economic growth in itself increases happiness or well-being. Economic growth leads to more and a greater variety of goods being produced —including, of course, more powerful weapons. It could lead to more leisure to pursue satisfying goals and to greater territorial security. But it does not do so automatically. It may be concluded that economic growth could increase well-being, but it certainly will not if it is pursued for its own sake without regard for the total needs of man. Unfortunately, too many people regard economic growth as an end in itself, and the ultimate yardstick of "progress." The result is that culture (and happiness) is made subordinate to the goal of greater production.

Surely the answer to the question 'Is economic growth desirable?' can only be *yes* if qualified by the proviso 'but only if it is given a subordinate rôle to the total well-being of the New Guinean.'

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*Reading.*

J. K. Galbraith (1958) *The Affluent Society.*
Vance Packard *The Waste Makers.*
Lewis Mumford *The City in History.*

# Poison Fish Projects Report*

SINCE 1958, the problem of ciguatera has been investigated at the Hawaii Marine Laboratory. Fish poisoning in the tropical Pacific has become increasingly common and, according to doctors in New Caledonia, cases of fish poisoning occur almost daily. Unfortunately, research is often hampered because patients rarely know the proper name of the fish they have eaten or recall where it was caught. This report covers the calendar year 1963, and describes the progress made in pursuing research into the problem.

The investigation has concerned itself with many phases of the problem; the biology of the fish that carry the toxin causing ciguatera and the possible origin of the toxin; the chemical isolation and identification of the toxin; the pharmacological action of the toxin; the epidemiology and symptomatology of the disease; the preliminary investigation of other toxic forms to see if they carry a toxin similar to that of the ciguateric fish; preliminary studies of native remedies for ciguatera; and even a compilation of names of plants and animals in the Pacific languages to facilitate the gathering of information. These various phases of the projects are coordinated and interdigitated, sharing personnel, laboratory space and facilities, specimens, costs of field work and collecting, and office and laboratory help.

Of major importance in 1963, and affecting all phases of the project, was the loss of a suitable location for the procurement of specimens and for field studies. Throughout the summer of 1962, fish were obtained and studied from Palmyra Atoll in the Line Islands, with supplemental catches and information being obtained from Christmas Island in the same archipelago. However, Palmyra no longer can be reached either by military or civilian transport, and the fish at Christmas Island, once moderately toxic, have so declined in toxicity as to render the island unsatisfactory for all phases of the study. Efforts to find a new site are discussed below.

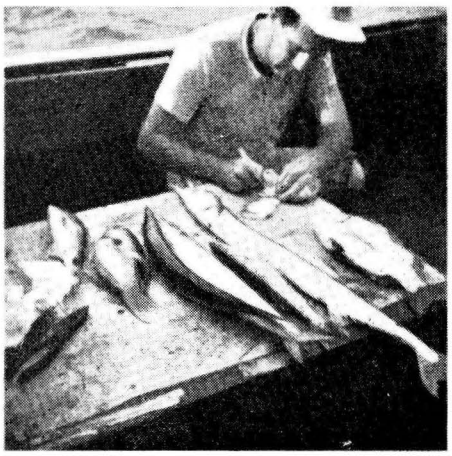
It should be noted that the programme has almost entirely recovered from the losses of the Hawaii Marine Laboratory fire of 1961, as it was possible to move personnel into a new, but small, laboratory in the late spring of 1963.

## BIOLOGY

### Field Investigations

In the early summer a field party was sent to Christmas Island, under the direction of Dr. Helfrich, with the objectives of studying the habits of the toxic red snapper, *Lutjanus bohar*, to contrast the fish, and the reef and food chain in toxic and non-toxic sections of the reef, to collect a large amount of the toxic fish for laboratory study, and finally to collect potentially toxic fish in the food chain of the snapper. While all of these aims were accomplished in the field, the decline in toxicity, discovered upon the return of the specimens to the laboratory, rendered most of the studies meaningless.

During the autumn of 1963, Dr. Helfrich visited Fiji to make field observations and to investigate the possibilities of procuring a steady supply of toxic fish. While there, he was able to visit several islands in addition to the main island of Viti Levu. He arranged his trip to coincide with the rise of the balolo and to obtain an extensive sample of the sardines which are reportedly toxic in the season of the balolo rise. His trip continued to the Society Islands, where he spent one week in the Windward Group, again making field observations and arranging for possible future procurement.



**Dr. Helfrich shown recording details of fish caught during a visit to New Caledonia.**

The possibility of Samoa for field studies was investigated by the principal investigator while he was there for other purposes during the summer. Evidently the problem of toxic fish in both American and Western Samoa is not acute, and the archipelago would not be suitable either for regular procurement or for field studies. Arrangements were made to obtain a sample of the reputedly toxic fish from Tutuila.

For procurement of highly toxic fish, one of the most promising sites is Johnston Island. On this island *Lutjanus bohar* does not occur and most of the reef fish are non-toxic (and are eaten by the civilian workers), but the large and abundant Gymnothorax are highly toxic. Plans have been made to work jointly with the Atomic Energy Commission investigation on the biological

*Under the heading "Assistance to Research," the Commission, for some years, has given financial assistance to research on fish toxicity. This report indicates that one of the problems causing delay in this field is the poor supply of poisonous fish to the Laboratory. As the dispatch of whole fish is costly, the best method is to crush the flesh, and, after placing it in a drier at 167°F, reduce it to flakes. This is possible in some territories. To our readers in New Caledonia, where fishing is such a popular sport, we would suggest that they would be well advised to test a small quantity of any suspect fish on an animal, and keep the rest in a refrigerator pending the outcome of the experiment. If the fish proves to be toxic it could be sent to the South Pacific Commission in Noumea, who will ensure its subsequent dispatch to the Laboratory in Hawaii.*

* From the Hawaii Marine Laboratory, University of Hawaii, 1963.

effects of dredging of the lagoon. There it is hoped to conduct a study on settlement of "new surfaces" that are postulated as the ultimate source of the toxin by Randall (1958), using, both test panels and the surfaces exposed by the dredging operations.

### Food Chain Transmission of the Toxin

During 1963, the five-year study on the comparative biology and food habits of *Lutjanus bohar*, the red snapper, and other similar groupers and snappers was completed. The study embraced a total of about 1,800 specimens, and included both the food habits and field observations on their biology.

As the food habit study of *Lutjanus bohar* indicated that the single most common food are the acanthurids, and as it is known that acanthurids will cause ciguatera, a study is being initiated on the food habits of *Acanthurus triostegous* and *Ctenochaetus striatus*. These fish appear to be algal feeders specializing in the finer algae, as indicated by Randall (1958). However, as they appear to eat any of the finer algae available, it is not known whether any decisive leads to the possible source of the toxin will be found.

From the epidemiological study by Mrs. M. J. Cooper, an officially appointed associate, there came an indication of a possible algal source of the toxin. She reported that the Gilbertese on the island of Marakei stated that, coincidental with the development of a highly toxic condition in the reef fishes, there appeared conspicuous patches of a previously uncommon algae. They attribute the toxicity to this algae. Mrs. Cooper, when on the island in 1962, observed that the acanthurids appeared to feed upon this algae, and she was able to collect and preserve a small sample of this. It has been identified as *Plectonema terebrans*, one of the cyanophytes. It was planned to make a special trip to the isolated island during the summer of 1963, but arrangements could not be made before the start of the autumn school-term. Through the cooperation of the Honolulu Biological Laboratory, the U.S. Fish and Wildlife research ship was able to make a one-day stop at Marakei during the autumn and to collect some potentially toxic algae and fish (received at the laboratory in late December). It is now planned to visit the atoll during the early summer of 1964.

### Laboratory Studies on Food Chain Hypothesis

As a necessary corollary to the food-chain hypothesis of the origin and transmission of the toxin, the fish, when feeding on toxic food, must become toxic themselves without harm to their own physiology and they must store, rather than metabolize or excrete, the toxin. The induction of toxicity through diet in normally non-toxic fish was studied previous to the Hawaii Marine Laboratory fire, and fortunately enough specimens, although without adequate data, were salvaged from the fire to publish a short paper on this in 1963. In this study it was found possible to induce toxicity in a normally non-toxic Hawaiian species by feeding it the flesh of toxic *L. bohar*. Unfortunately, the data were not quantitative, and a new experiment has been started to show the quantitative transmission of the toxin.

In December, 1961, a number of toxic *Lutjanus bohar* were introduced from Christmas Island to the laboratory ponds. Since that date they have been fed on a non-toxic diet. A small number of these fish are sampled for toxicity periodically. Because the samples have been small and the original level of toxicity not high, no statistical studies on the possible decline of toxicity can be made until the experiment is concluded some time in 1964. However, in the two-year period there has been no obvious loss of toxicity.

### Toxins of Other Species of Fish

Preliminary extractions of the grouper, *Epinephelus fuscoguttatus*, and the morays, *Gymnothorax flavomarginatus* and *javanicus*, have shown that toxins may be extracted in a fashion exactly parallel to that method used for *Lutjanus bohar*. Also, no difference was observed in the symptomatology of the toxin carried by these fish in either of the test animals, the mongoose or the mouse. Pending the actual chemical identification of the toxin of *L. bohar*, it is presumed on the basis of this evidence that the toxin in these fish is similar to or identical with that found in *L. bohar*. Similarly, it has been impossible to detect chemical or pharmacological differences between the toxins from Gymnothorax from either the Line Islands or from Johnston Island.

There are now available toxic *L. bohar* or other species of fish from New Caledonia, Fiji, the Society Islands, Johnston, and Wake Islands. During 1964 it is hoped to make similar comparative studies on their toxins.

However, parallel chemical extracts on the acanthurid, *Ctenochaetus striatus*, have shown a difference in their toxin from that found in the large carnivores. In the extraction method the toxin is separated from ethanol-water mixture by the use of diethyl ether, with virtually all of the toxin of the carnivores going into the diethyl ether layer. However, on the few acanthurids tested, the toxin remains in the aqueous layer. This might be the result of one of three things—

(1) That the acanthurids bear a precursor of different chemical structure and solubility which is chemically changed by the metabolism of the carnivore;

(2) That the acanthurids bear an entirely different toxin, and that the food chain hypothesis is incorrect;

(3) That because of different water content and a different series of fat-soluble compounds—therefore a different extraction system—the toxin, while the same, will appear in the alcohol-water fraction. This will be investigated again as soon as an adequate supply of toxic acanthurids can be obtained.

### Bioassay

Dissatisfaction continues with the present methods of bioassay, which use the reactions of the mongoose to test feedings for original screening of the potentially toxic fish, and the reactions of mice to intraperitoneal injections of potentially purified extracts. At present a new system for simple and rapid extraction of the toxin from the fish is being explored. The Bligh and Dyer tri-solvent method of lipoid extraction was tested and found to be rather unreliable. The use of acetone is now being investigated to extract small samples of fish. The extract is to be injected intraperitoneally into mice. It is hoped that this method will lead to a more rapid and more quantitative method of screening of fish in the laboratory and may also lead to a more simple field test.

To substitute for the mouse test in the chemical extract of the toxin, the Laboratory again explored the impedence of the nerve impulse at the neuromuscular junction in pharmacological preparations. The results were unsatisfactory, and the project has been deferred until a qualified pharmacologist can be obtained.

## CHEMISTRY

### Procurement

As indicated above, the supply of highly toxic fish obtained at Palmyra was exhausted during the year. With the fish from the Line Islands no longer available, the major effort during the autumn was to obtain a new source of fish for the chemical studies. Unfortunately, the chemical studies demanded a very large and steady supply of highly toxic fish, and the lack of this supply impeded the investigations. It is hoped that the possible procurement systems in Fiji, the Societies, and Johnston Island will soon be producing an adequate supply.

### Isolation and Identification

During the year, new steps were added to the procedure for chemical isolation of the toxin. These include precipitation of impurities in low temperatures using different solvent systems in silicic acid columns. This improved procedure has led to the final isolation of the toxin.

The toxin, as obtained, has been subjected to a series of tests including thin-layer chromatography, paper electrophoresis, and counter-current distribution, and gives every indication of a pure compound. However, the compound has not been crystallized. The amounts obtained to date have been too small for chemical tests for structural analysis (the present yield is about two parts in a million of raw fish flesh). As soon as an adequate supply of toxic fish is obtained, the studies will continue on the elemental and structural analysis of the toxin.

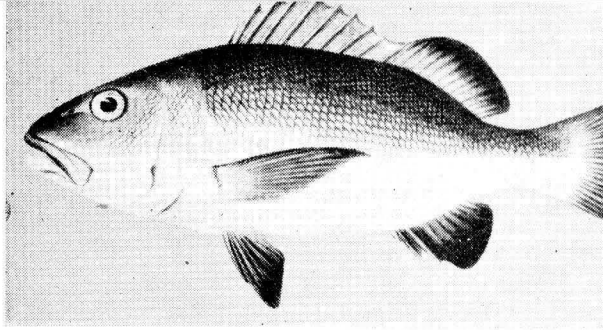
### Colorimetric Chemical Tests for the Toxin

During the year 1962-1963, Dr. Motokazu Asano, a biochemist from Japan, was associated with the programme. With the aid of funds from the University of Hawaii East-West Center, he explored the reaction of the flesh of toxic fish to over forty known chemical tests for steroids and related compounds. He found some correlation between toxicity and colour reaction in the Lieberman-Burchard and Salkowski tests, but evaluation of the data revealed that the results did not have sufficient statistical reliability for use as a bioassay. It is now presumed that the colour resulted not from the toxin but from some steroid coincidental in its distribution with the toxin.

### Other Toxins

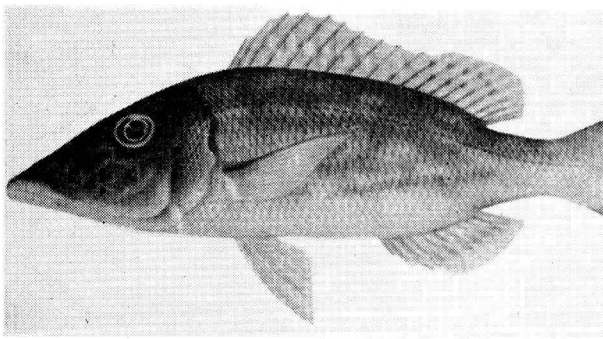
In 1962 preliminary investigations of a poisonous coelenterate, *Palythoa vestitus*, indicated that this coelenterate was indeed toxic, but the toxin was not closely related to that causing ciguatera. With the partial support of this investigation, but with major supports from other grants, Dr. Richard Moore, working with Dr. Scheuer, was able to isolate the toxin from this zoanthid. They anticipate publishing upon their methods and the empirical formula of the toxin within a few months.

Two students, one for his master's degree and the other for his doctorate, completed theses during the year on marine toxins; both had the partial support of the combined investigations. Mr. William Eger, for his master's thesis, was able to show that the puffer fish, *Arothron hispidus*, produced in its skin a toxin similar to, if not identical with, the toxin found in the liver and gonads. Mr. Eger also reported upon a survey of similar toxins in other plectognath fishes. Mr. Donald A. Thompson established that the boxfish, *Ostracion lentiginosus*, when subjected to stress, produced a toxin from skin glands and that this water-soluble toxin had a lethal effect upon fish in the vicinity.



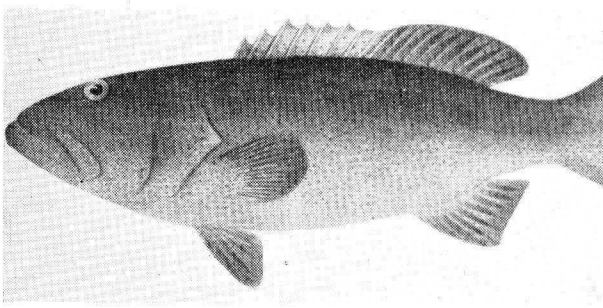
**LUTJANUS BOHAR** Forksal.

**The red snapper, red emperor, l'anglais. This fish is probably the most consistently toxic fish in the tropical Pacific. Alive, it is a bluish hue on top, and pink to red along the belly; however, soon after dying the fish turns a brilliant red.**



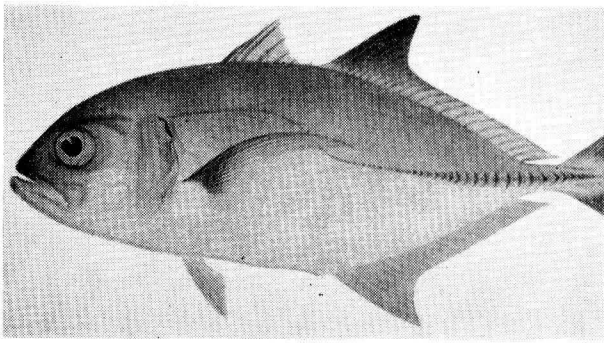
**LUTJANUS MINIATUS** (Schneider).

**Scavenger fish, sweetlips. This is a silvery grey fish, and is often quite toxic in poisonous areas.**



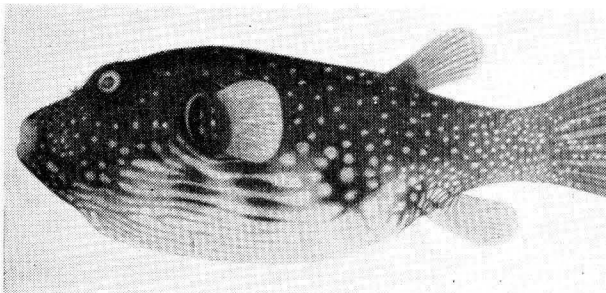
**PLECTROPOMUS TRUNCATUS** Fowler.

**One of the groupers; light-brownish with numerous bright blue spots. It is frequently violently toxic.**



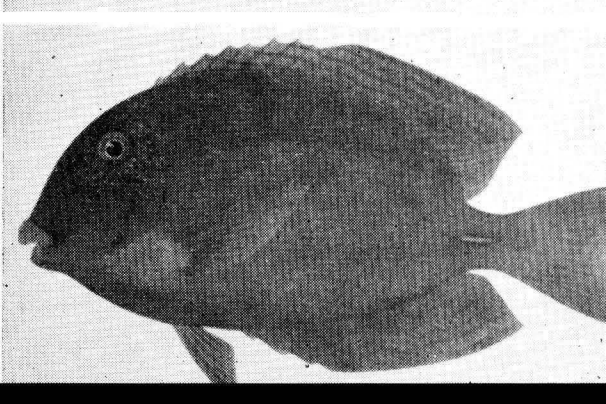
**CARANX LESSONII** Cuvier & Valenciennes

**One of the jacks, trevally, or crevally. This fish, usually highly esteemed as food, becomes toxic in areas such as the Palmyra Atoll. In Fijian waters it is reported to be toxic only during the balolo season.**



**AROTHRON HISPIDUS** (Linnaeus); **also known as TETRAODON HISPIDUS.**

**One of the numerous puffers or toadfish, which are characterized by their ability to inflate themselves into a balloon. These fish, in all parts of their range, are reputed to be highly toxic unless correctly prepared for cooking. Also related is the toxic balloon fish, with sharp spines, often known as the porcupine fish** (Diodon).



**CTENOCHAETUS STRIGOSUS** (Bennett).

**A black surgeon fish with stripes —known in Tahiti as the Maito. This is an herbivorous fish that becomes highly toxic in certain areas, and is fed upon by the larger snappers and groupers; it may be important in the transmission of the toxin along the food chain.**

### PHARMACOLOGY

Because of the inability to find a qualified pharmacologist to work full-time with the Laboratory, only slight progress was made in pharmacological studies. On the advice of the consultant, Dr. Hamilton Anderson, the graduate assistant explored the "beer-can test" developed by Dr. Dermott B. Taylor, of U.C.L.A., for drugs. While the mice responded to ciguatera toxin in this test, it was found that the test did not give more accurate results than the previously used test and took considerably longer. As noted above, no further advances were made on the test using neuro-muscular preparations. At the end of 1963 we were hopefully awaiting permission to be granted by the U.S. Consulate, for Mr. Kwan-ming Li, from Hong Kong, a man experienced in pharmacology, to join the staff for one to two years, and we were also arranging for Dr. Yasumi Ogura, a leading Japanese pharmacologist working on the fish toxin, to visit the Laboratory for three months during the summer of 1964.

### NATIVE REMEDIES

Through the help of Dr. Jacques Barrau of the South Pacific Commission, samples of *Duboisia myoporides* from New Caledonia were obtained during the year. This species of *Duboisia* has been reported to be of specific use by the New Caledonians for the treatment of ciguatera, and has been shown by chemical studies to contain a number of alkaloids. Preliminary studies of the extract gave ambivalent results when injected into mice in which controlled ciguatera had been produced. More precise experiments on this reaction are continuing.

During his visit to Fiji, Dr. Philip Helfrich was able to obtain samples of some *Ficus obliqua* which is used for the treatment of ciguatera in those islands. It is planned to investigate this remedy as soon as studies on *Duboisia* are completed.

Through epidemiological questionnaires (see below), information is being obtained on other native remedies.

### EPIDEMIOLOGY

Dr. Philip Helfrich published a compilation of all cases of fish poisoning reported in the Hawaiian Islands in this century. Most cases were the result of eating fish brought from known toxic areas, such as Palmyra, Johnston, or Midway Islands. No ciguatera from fish of Hawaiian origin was reported previous to 1956, but from that date to 1963, five outbreaks, afflicting 38 persons, were reported (since publication, the first death from ciguatera caused by a local fish has occurred). Outbreaks of ciguatera from fish caught in Hawaii appear to be increasing.

The study of Mrs. M. J. Cooper on the epidemiology of ciguatera in the Gilbert Islands has been completed and submitted for publication. In this island-to-island survey of the Gilbert Archipelago, Mrs. Cooper, speaking in Gilbertese, interviewed village elders and fishermen on the present extent and past history of toxic conditions, together with the species involved. Her study produced the most accurate information yet obtained on the geographical limitations of toxic areas.

In 1962, booklets prepared by Dr. Helfrich explaining fish toxicity in the Pacific were distributed together with questionnaires to be answered on the general picture of ciguatera in Pacific islands and on specific cases of poisoning. To date 53 questionnaires have been returned. Dr. Guy Loison, of the South Pacific Commission, reported that the replies to the French questionnaires sent to the French-administered islands were much more complete, and that they are now being translated by the South Pacific Commission. It is expected to receive these early in 1964.

From the questionnaires and from personal interviews, it is now established that ciguatera exists in every major archipelago in the South Pacific, but that its seriousness varies. The Laboratory has also been informed of a recent marked increase in toxicity of fishes about the Marquesas and American-held Wake Island, and is now planning to extend its studies to include the latter.

In epidemiological studies it is often found impossible to identify fish referred to, as only their native names were used. As an aid in this study, glossaries of plant and animal names for the major languages of Polynesia and Micronesia have been prepared. (Because of the extremely large number of languages involved—over 200 reported from New Guinea alone—Melanesia was not included in the study.) In the summer of 1963, nine different glossaries were issued in mimeographed form. These glossaries, based solely upon library studies, are as yet incomplete. They are now being sent to people in the field who have a knowledge of the local language and of the scientific identification of the local flora or fauna. It is hoped that in the course of the year, sufficient additions and corrections will be obtained to warrant the publication of interlingual glossaries of biological names of the Pacific. To date, 170 copies of the mimeographed glossaries have been distributed.

# In-service Training at SPC Headquarters

## Internships

In order to develop further the direct association of islanders with the work of the Commission, the Commission at its Twenty-fifth Session agreed to a proposal that a small number of internships within the three work-programme sections of the Secretariat and in its general administrative-financial organization might be arranged in 1964 on an experimental basis. In particular, the Commission decided that—

(a) One intern might be attached to each section during 1964.

(b) Interns should possess qualifications or experience in the relevant field necessary to their useful training and to their making a useful contribution while in the service of the Commission.

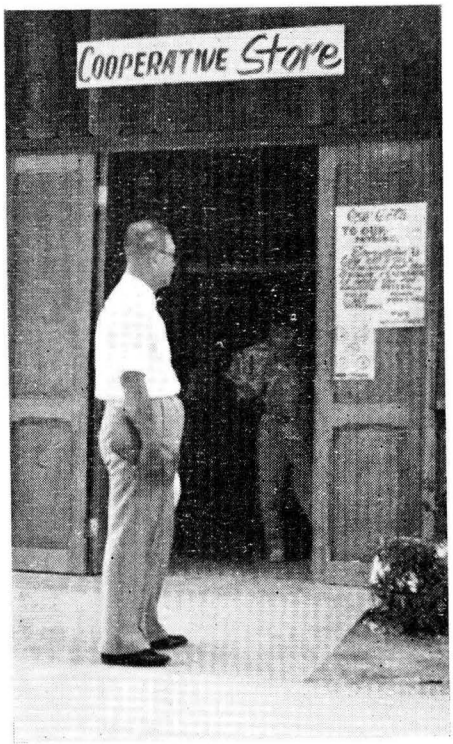
(c) Salaries and travel to and from Commission headquarters should not be a charge on Commission funds.

The Commission has made a small budgetary provision for a modest allowance to meet some local expenses of up to four interns in 1964. Accommodation can be provided at Commission headquarters. It would be necessary that the salary (or stipend) and travel to and from Nouméa be taken care of by the territory concerned in each case, or by the territory with the assistance of a fellowship from some other source. As a result of an approach to the United Nations Technical Assistance Board, we are in a position to count on three fellowships of a reasonable amount for 1964, with an excellent prospect of the same for 1965. It should thus be possible to make arrangements for the travel and salary expenses to be met in the case of up to three territories desiring to place an intern with the Commission for six months of in-service training this year, and also next year if the Commission considers the 1964 experiment successful and approves its continuance in 1965.

It is intended to place one of these interns in each of three out of four sections of the Secretariat Organization, i.e., health, education and social development, economic development, and administrative-financial; but this depends upon the needs of the Secretariat, the wishes of the territory, and the qualifications of the nominees.

Territorial administrations have been invited to consider sponsoring interns during this year. Among the requirements for the fellowships are an official request from the government concerned and a medical certificate of physical fitness.

# Experts Examine Co-operative Credit Schemes




Dr. Pablo N. Mabbun studies a notice on the door of a school co-operative store visited during the course of a field trip.

By R. H. Boyan*

*The problems associated with the introduction of a sound policy of co-operative credit, mainly for primary producers, were discussed by experts from six Asian countries in a conference held at Baguio in the Philippines from 8th to 14th December, 1963, by the South-East Asia Office of the International Co-operative Alliance in association with the Central Co-operative Inc. of the Philippines.*

ECONOMIC conditions in the rural areas of Asia make it imperative that primary producers receive credit if production levels are to be raised. A variety of co-operative credit programmes has been tried. The implementation of each has been hindered by many difficulties and each country has sought ways of surmounting those difficulties so that the aim of increased production can be realized.

The proposal to hold the conference gave an opportunity for expert evaluation of the remedial measures that have been adopted in the various countries. That evaluation provides useful guide lines for the future. Symptomatic of the desire for such guidance was the decision taken in the Philippines to follow the conference with a national seminar at which the discussions and conclusions of the conference could be examined in relation to the local situation. Some of the experts were able to accept invitations to extend their stay to assist at the seminar.

The discussions were wide-ranging and it is intended here merely to indicate some of the main points which came out of the discussions, particularly those which may have some relevance to conditions in the Pacific islands.

### Not Enough Funds

One of the difficulties that have been met in attempts to implement sound co-operative credit programmes is that the funds that could be made available were not enough to meet all the needs of primary producers. This meant they continued to have recourse to traditional sources, which suggested for a variety of reasons that default was common and the aims of increasing the income of the producers and encouraging them to increase production were not realized. One solution is to concentrate available funds in one area so that a full-scale effort could be made; but this may have political repercussions.

A fault in some programmes was that the granting of credit had not been linked with agricultural extension measures designed to show the farmer how to use the loans given to him in such a way that production and incomes would be increased.

Another fault has been the failure to link the development of co-operative marketing facilities with the credit programme. Faced with the need to carry on using traditional marketing outlets, many farmers continued to receive low prices for their produce, which gave them little incentive to produce more; in addition, they were under pressure, if they wished to sell their crops, to continue to deal with private moneylenders who, in many cases, were also the buyers of the produce.

Management of credit co-operatives has often left much to be desired. Office-bearers and employees have had little basic and technical education and the task of training them for efficiency is a formidable one. At the same time, inadequate attention has been given to encouraging the emergence of capable leaders.

Under most schemes it was hoped that savings from members would help build up the funds of credit co-operatives. In many cases the results were disappointing. Lack of education of members to realize the importance of depositing savings was one reason. Another was that the hoped-for increase in incomes had not come about, so there was no margin for increased saving.

Often there was insufficient supervision of the use of the loans and inadequate attempts to ensure recovery.

One Asian country in which a sound structure of co-operative credit has developed has been Japan. In regarding Japan as a model, the feeling of the experts was that, while there was general appreciation of the rôle of co-operatives in Japan in mobilizing rural savings to a high degree and contributing to high agricultural activity in that country, the view was expressed that caution must be exercised in attempting to translate the Japanese experience into practice in other countries of South and South-East Asia.

### Pilot Scheme

The conference made a close examination of the pilot scheme introduced into the Comilla District of East Pakistan. This scheme was framed with a knowledge of all the obstacles which had impaired the success of credit programmes in East Pakistan and elsewhere. It is described as a scheme of supervised credit and incorporates an extension programme directed towards increased production, intensive training, a public works programme, the establishment of a machinery pool, the provision of co-operative marketing and retailing facilities, and a carefully planned and supervised lending programmes. With the experience so far gained, extension to other areas is now planned.

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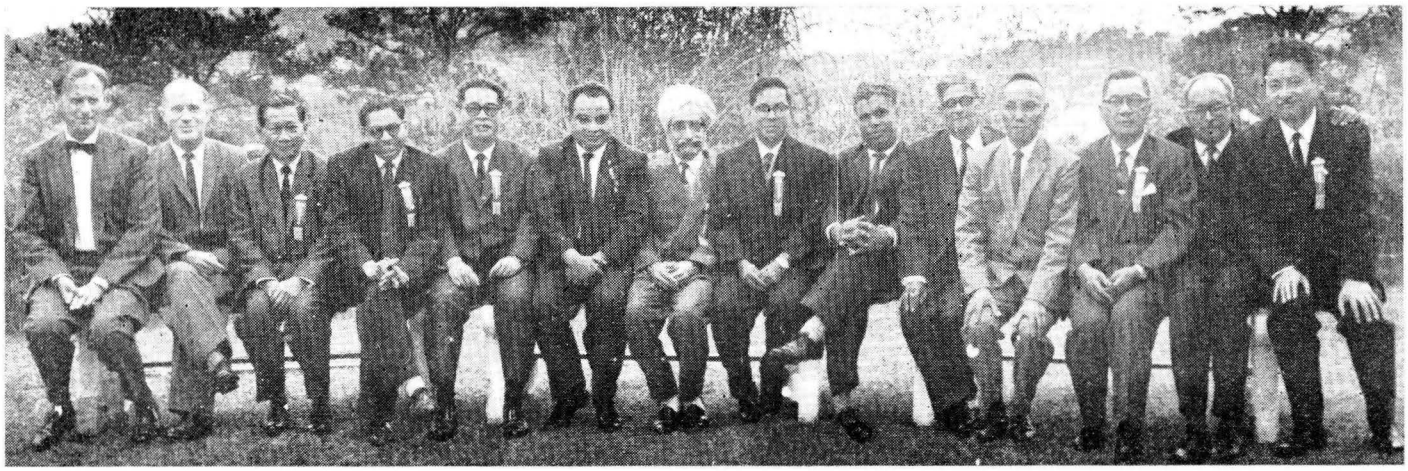
* Co-operatives Specialist, South Pacific Commission.



Participants to the conference held in Baguio City, Philippines, were (from left to right): Messrs. E. B. Loveridge (U.K./Philippines), R. H. Boyan (SPC), C. Saranaga (Thailand), J. Rana (ICA), E. V. Mendoza (CCE, Philippines), Dr. S. K. Saxena (ICA), Dr. M. Singh (ECAFE), Prof. A. F. A. Hussain (East Pakistan), Messrs. H. S. Wanasinghe (Ceylon), V. M. Joglekar (India), Dr. N. B. Tablante (Philippines), Dr. P. N. Mabbun (Philippines), Messrs. K. M. Das (India), and Y. Nakahara (Japan).

One problem with the Comilla approach is that the extensive supervision and training activities are costly. The scheme is made partly self-supporting by a service charge on loans, but expenses of the central training centre are met by the government. The future progress of the scheme will be watched with close interest throughout South and South-East Asia.

How far is this relevant to the Pacific islands?

### Seasonal Crops

The fact that the Pacific islander is not dependent on seasonal subsistence cash crops to the same extent as the people of Asia places him in a favourable position. He does not have the same need for production credit and, in many territories, a considerable export trade has been built up without credit facilities—Western Samoa and the Gazelle Peninsula of New Britain in the Territory of Papua and New Guinea come to mind in particular.

Nevertheless, there are some areas which are largely dependent upon seasonal crops and this tendency seems to be growing. There is also a growing need for large amounts of capital for transportation and processing facilities, which are necessary in attaining a higher level of primary production. Finally, there are some areas of land which can be developed only with loan money instead of by the established method of direct capital formation, that is, by hard work without financial assistance.

It seems probable, therefore, that in the Pacific islands the need for co-operative credit societies will steadily increase. If so, Asian experience seems worth studying.

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## PLANT AND ANIMAL WORD LISTS

PROFESSOR A. H. BANNER, Professor of Zoology of the University of Hawaii, aided by funds from the U.S. National Institutes of Health, is compiling a series of word-lists of Pacific plant and animal names, listed alphabetically from the island vernacular to the English and/or scientific name. In view of the present lack of biologically accurate dictionaries of Pacific languages, these lists should prove of interest and assistance not only to biologists and agriculturists but to administrators and medical personnel as well.

The following lists have been compiled and mimeographed up to the present—

1. TUAMOTUS—plant and animal names (52 pages).
2. CAROLINE ISLANDS—plant and animal names (49 pages).
3. TAHITI—plant and animal names (57 pages).
4. SAMOA—plant and animal names (123 pages).
5. GILBERT ISLANDS—plant and animal names (70 pages).
6. MARSHALL ISLANDS—plant and animal names (43 pages).
7. MARIANA ISLANDS—plant and animal names (43 pages).
8. FIJI—animal names only (45 pages.*
9. TONGA—animal names only (52 pages).*

These lists have been compiled primarily from dictionaries, and Professor Banner does not consider them definitive. He hopes to obtain the co-operation of scientifically or linguistically interested people working in the islands, to supplement and correct these lists with the eventual aim of publishing complete glossaries. Other lists are being prepared for other Polynesian and Micronesian languages, and similar co-operation will be welcomed in order to complete these.

* New official compilations of plant names in Fiji and Tonga are at present being prepared by the respective Departments of Agriculture.

Those interested should contact Professor Banner at the Department of Zoology, University of Hawaii, Honolulu, Hawaii. Full acknowledgement will be made of any help received when the lists are re-issued. Inquiries for existing lists should also be directed to Professor Banner.

### PICTURE CREDITS

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# Solar Distillation on the Pacific Atolls

By Professor Everett D. Howe*

*One of the articles appearing in this issue of the* SOUTH PACIFIC BULLETIN, *"Drinking Water in the Tuamotu Islands," written by Dr. Perrot, draws attention to the public health hazards connected with badly-constructed water tanks. Several territories in the South Pacific region, anxious to provide their populations with an adequate supply of wholesome drinking water, have informed the SPC of their interest in the possibility of sea-water distillation.*

*The SPC approached several experts with this problem. Professor Howe agreed to come to Rangiroa (Tuamotu Islands), in order to conduct experiments with several types of solar stills developed by the University of California and by the Commonwealth Scientific and Industrial Research Organization (CSIRO). The Commission provided Professor Howe's travelling expenses and the cost of shipping the necessary equipment to Tahiti, whilst shipping costs from Tahiti to Rangiroa were arranged by the Government of French Polynesia. On location, Professor Howe was assisted by the Director of the* Institut de Recherches des Huiles et Oleagineaux (IRHO).

THREE small solar stills were set up near the IRHO headquarters at Tiputa, Rangiroa Atoll, and were to be operated for a period of six months under the supervision of the IRHO Director. The description of these stills is as follows—

1. Greenhouse-type with asbestos cement basin and glass cover, developed and furnished by the Division of Chemical Engineering, CSIRO, Melbourne, Australia. The basin is the central element and is produced commercially in Australia. The inside dimensions of this basin are 106 cm. wide by 172 cm. long. At Tiputa it produced 9.5 litres on 24th August, 1963.

   The estimated costs of the components for this still have been given by the CSIRO. These are—

| | |
|---|---|
| Asbestos cement tray | US$9.55 |
| Glass (including 2 spare sheets) | 4.50 |
| Caulking compound | 4.50 |
| Insulation, fittings, etc | 11.20 |

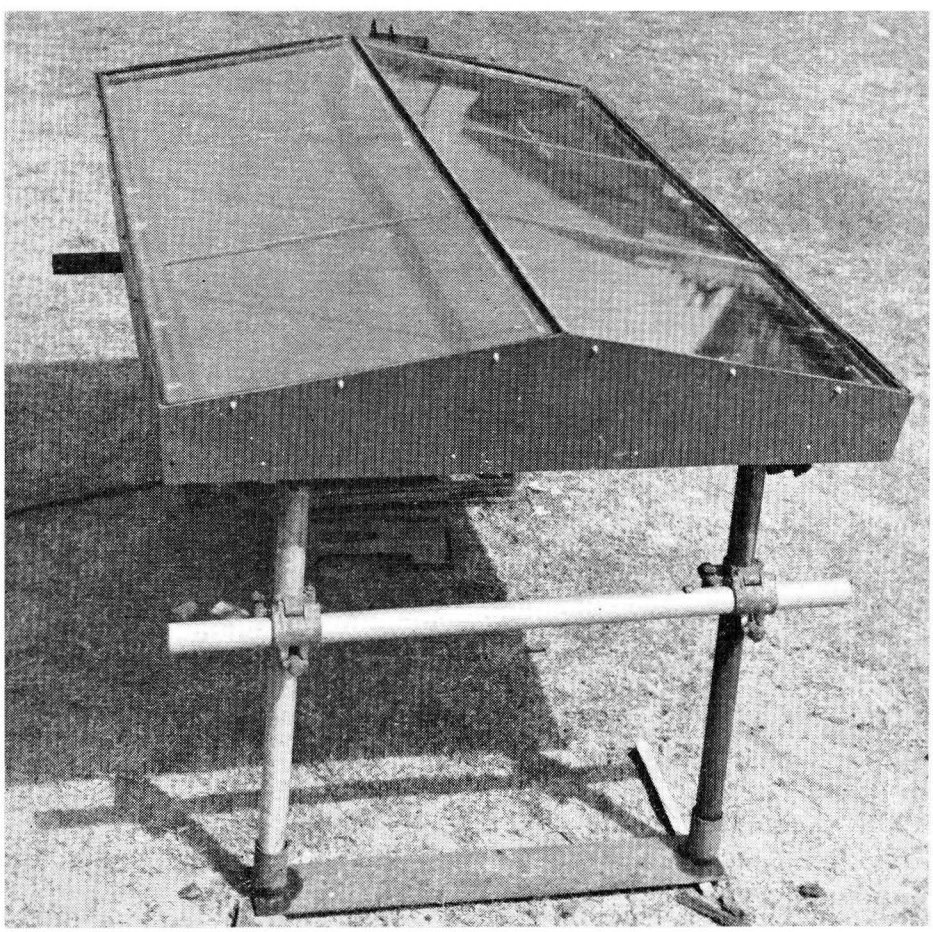
   The cost of parts is less than $30. (£A.13/1/8d.).

2. Inclined-tray unit with sheet copper tray and glass cover, furnished by the University of California. The projected area of this tray is 91.5 cm. wide by 183 cm. long.

   It should produce nearly nine litres per day. The report from Tiputa is not yet available, so that the production rate there is uncertain.

   The cost of this equipment is less certain than that of the Australian unit, since these units are not commercial as yet but are still in the experimental stage. Also, this type of equipment can be made in different lengths, the longest tray rolled so far being 550 cm. long. The most costly part of this type is at present the end seal for the copper tray. A unit of this type 365 cm. long and capable of producing nearly 20 litres per day would cost between $30 and $50 for the components.

3. Circular still with plastic cover, furnished by the University of California. It is circular in ground plan, 280 cm. in diameter, covered with a conical transparent plastic tent about 45 cm. high. A unit of this design was installed at Rangiroa and produced more than 22 litres on 24th August, 1963. The cost of materials for this unit is about $25.



**Solar still, developed by the Australian CSIRO; the asbestos-cement tray located beneath the glass covers costs £A.4/5/0d.**

* Director, Sea-water Conversion Laboratory, University of California, Berkeley, California.

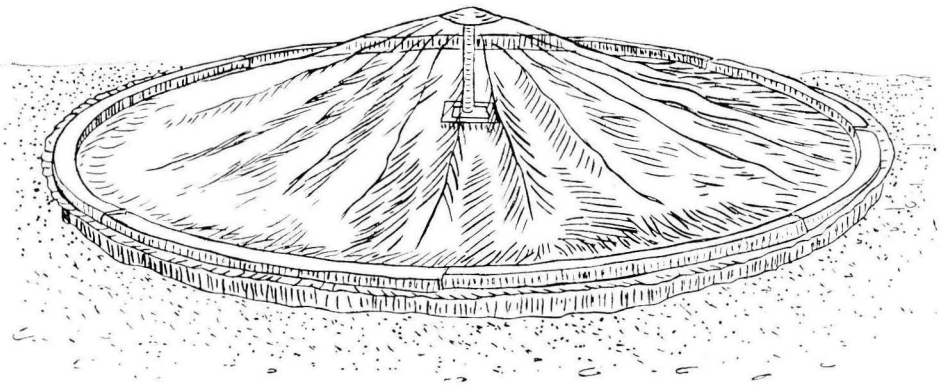


Fig. 1 (a). Plastic-covered circular solar still (elevation)

## General Discussion

So far as Rangiroa is concerned, there appear to be two related needs. These are both to meet the requirements for water in remote island locations during the harvesting of coconuts. By discussion, it seemed that permanently installed stills, possibly based on the circular design, would be very attractive where more than two or three workers are involved at the remote locations. Where only two or three men are involved, a unit producing 10 to 12 litres per day, and sufficiently portable to be transported in the island work boats, would be of interest.

The solar conditions appeared to be favourable, since there are no mountains or other high elevations to hold cloud formations. The proximity to the equator, 15° South latitude for Rangiroa, makes for a high year-round availability of solar energy.

The most important consideration is that of cost. The competitive system would be that of rainfall collection and storage. The figures for rainfall at Rangiroa for the period 1951 to 1962 are available and show an annual average of 1.43 metres. If this were to be utilized at an average rate of .12 metres per month, the storage capacity required would be 0.26 cubic metres per square metre of roof collection area due to the average monthly variation of the rainfall. If the 24-hour maximum rainfall is to be exploited to full advantage, additional capacity must be provided so that a total cistern capacity of at least 0.42 cubic metres per square metre of roof collection area would be required for this purpose. The cost of a collection system and cistern would need to be compared with the cost of an equivalent solar still.

If the circular still at Rangiroa is assumed to produce 20 litres per day, this would be equivalent to a rainfall collector area of five square metres and its adjunct cistern of a little over two cubic metres volume. The circular solar still could be arranged to collect rainfall, and has a ground area of 6.15 square metres. By providing a storage capacity of 100 to 200 litres to allow for five to ten rainless and sunless days, a daily supply of 20 litres could be assured. The excess rainfall would simply overflow.

The cost of small wooden or concrete cisterns in the U.S.A. is about $0.20 per litre, so that the cost of a cistern to contain two cubic metres would be about $400. There is some question as to the cost of cisterns in Rangiroa, since these are locally constructed of non-reinforced concrete, so that the only cash involved is that needed for the imported Portland cement. Sand and aggregate are obtained from the local shore areas. The cost of the rest of the system would involve the provision of five square metres of catchment area, together with gutters and piping to convey the collected rainfall to the cistern. If the collection area is the roof of a building, its cost can be discounted. Sheet metal gutters and piping to the cistern would cost approximately $10 to $15, depending on the general layout.

While the cost of cisterns in Rangiroa is not known to the writer, the above considerations lead to the conclusion that pure water in the amount of 20 litres per day could be secured as cheaply by a circular solar still equipped also to collect rainfall, as by a rainfall collector system in which the cistern capacity is large enough to completely exploit the rainfall. The solar still could be cheaper than a rainfall-collector system if no roof is available and if a structure must be provided for collection of the rainfall.

The preliminary observations noted above must be regarded as tentative, and subject to revision on the basis of the continuing operation of the pilot stills at Rangiroa. As a result of the field trip, certain redesigns of the solar units are under way.

## Solar Distillation at the University of California

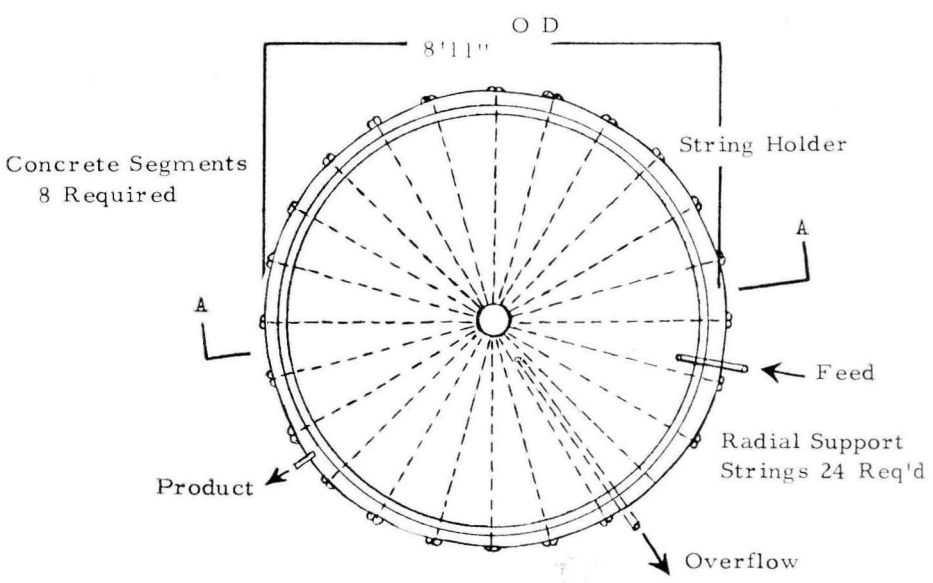
Studies of various configurations of simple single-effect solar stills have been going on since early 1952 at the Richmond Field Station of the University of California, Berkeley, California.

Two different types of solar still have been developed—namely, the circular still with plastic cover and base, and the inclined-tray still with copper-foil water tray and glass cover. The circular still is designed to furnish water for a single family in an isolated location at a minimum capital expenditure, and the inclined-tray unit is designed for possible assembly into large and efficient solar plants.

## Circular Solar Still

This unit is shown in cross-section in Figure 1(c) and in Figs. 1(a) and 1(b). It has a water basin eight feet in diameter and the prototype models have produced in excess of five gallons, or over 20 litres per day.

Fig. 1 (b). Plastic-covered circular solar still (plan)



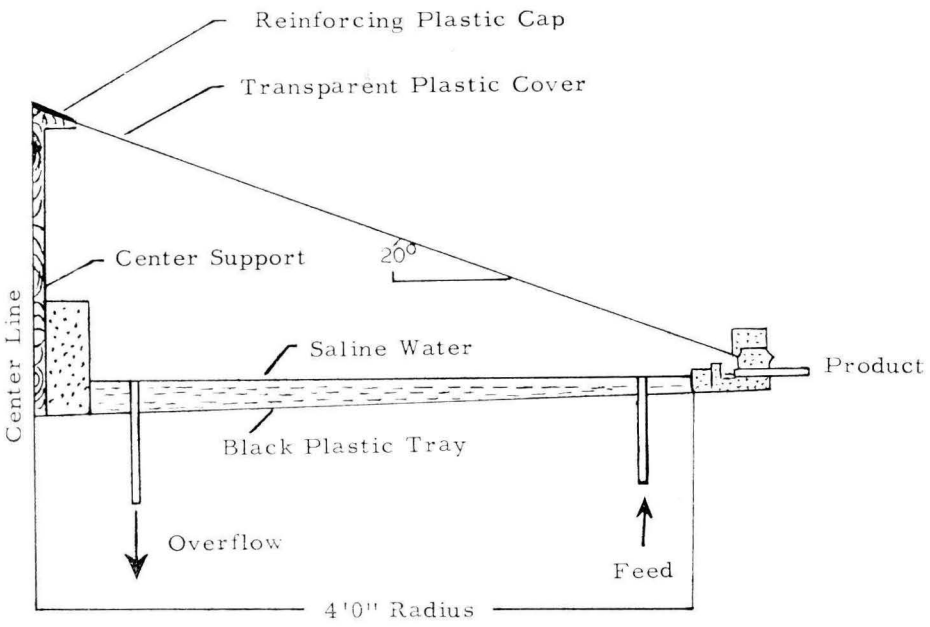



Fig. 1 (c). Plastic-covered circular solar still (Section A-A) from Fig. 1 (b)

This solar still is constructed on the ground, with the circular shape outlined by precast reinforced concrete segments containing a drip-trough for the condensate. The black-polyethylene basin liner is laid over these segments and held against the ground by the weight of other concrete segments laid around the inner periphery of the basin. The transparent cover, made of cellulose acetate sheet, is supported by a central pedestal and a number of radiating strings extending from the top of the central pedestal to the outer edges of the segmented drip-trough units. This cover is held down at the periphery by the weight of a third set of precast concrete segments, so shaped in cross-section as to force condensate collecting on the under surface of the transparent cover to fall into the drip-trough. The black-polyethylene basin liner is depressed into the drip-trough and serves to waterproof this component. It is held in the trough with mastic and connected to the outside condensate storage by a plastic tube sealed into the sheet with mastic. Plastic tubes for filling and overflow level control penetrate the polyethylene basin liner and are sealed into it with gasketed brass fittings.

This unit was developed for situations in which potable water is needed for four or five people at locations where there is no central water distribution system (about 4.5 gallons per day). The diameter of this solar-distiller unit is somewhat arbitrary but makes full use of the standard available five-foot width of cellulose acetate sheet with a minimum number of seams.

While the prototype units have utilized precast concrete elements for outlining the periphery and holding the plastic sheets in place, it would be possible to make use of formed plastic or fired-clay components for the same purpose. A study of alternate materials is now being made.

The cost of materials for this unit is about $25, the most expensive component being the transparent plastic cover. Cellulose acetate has been the most satisfactory material for this purpose so far, and the cover made of this material would cost about $12. Other materials for the cover are being investigated.

### Inclined-tray Solar Still

This unit is shown in cross-section in Figure 2. This prototype unit has consistently produced between 4.5 and 5 gallons per day on clear days in the summer at Richmond, California (latitude 37° 30′ N).

This type of solar unit is designed for installation on a sloped embankment, although the prototype was mounted on a wooden frame. The central element is the water tray made of copper sheet .004 in. thick and formed in a series of steps by a rolling process. The rolling is accomplished one step at a time because of the very high cost of producing the forming rolls. It should be noted that trays much longer than twelve feet should be possible, and that one tray, eighteen feet long, has been successfully formed by the simple rolling equipment available.

The copper tray and glass cover are supported by precast concrete members resting on the sloping earth, and anchored to concrete or stone piers to preserve the alignment. It should be noted that this prototype is mounted on a wooden frame rather than allowed to rest on an earthen embankment. This mounting was used merely as a matter of convenience.

The precast concrete longitudinal elements have been made in units three feet long, so that the trays are then fabricated in integral multiples of three feet.

The sealing of the ends of the water troughs against water leakage has presented something of a problem. The first prototype was fitted with cast brass closures, which were too expensive for general use. The next unit was fitted with cast plastic end seals, which also proved to be expensive. However, the development of new moulds for these seals is expected to reduce this cost to a satisfactorily low figure.

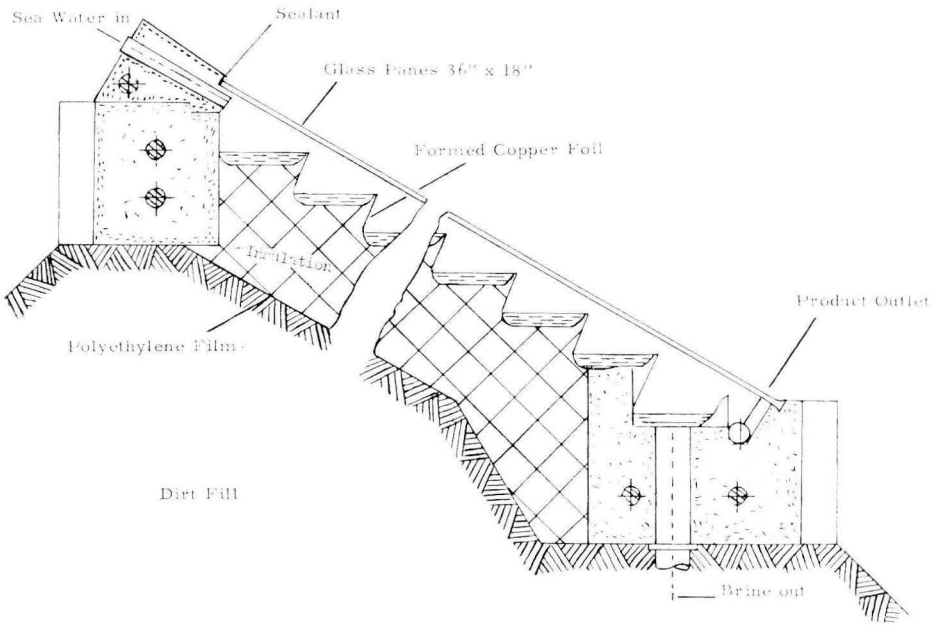



Fig. 2. Inclined-tray solar still with copper-foil water basin

# The Work of the South Pacific Commission, January-March, 1964

*The Commission advises Governments and Territorial Administrations and provides technical assistance in the fields of health, social development and education, and agricultural and economic development in the South Pacific region. Its Work Programme for 1964 was laid down at the XXVth Session, October, 1963.*

THE main events of the quarter were—

● Work on the UN/SPC Rhinoceros Beetle Project was inaugurated with the appointment on 1st January of **Dr. C. P. Hoyt**, formerly Entomologist with the South Pacific Commission, as Project Manager, and the establishment of the headquarters of the project at Apia, Western Samoa.

● The Rhinoceros Beetle Control Board, consisting of representatives of each of the member governments and Western Samoa, met at Apia in March.

● The Second Regional Conference on Plant Quarantine in the South Pacific was held at Apia, Western Samoa, and included representatives of nine territories in addition to those of Tonga and Western Samoa, and representatives of the Food and Agriculture Organization of the United Nations, the Australian Government, and the SPC. (The first such conference was held at Suva in 1951.)

● Courses in health education in the Gilbert and Ellice Islands Colony were conducted by one of the Commission's Health Education Officers.

● The regional survey of handicrafts was completed and production of a sales brochure started.

● A medical statistical survey within the SPC area—requested by thirteen territories—commenced.

● Work on the production of a nutrition textbook began.

● Notification was received of the appointment of **Sir Derek Jakeway**, Governor of Fiji, as United Kingdom Senior Commissioner on the SPC, and of the appointment of **Mr. R. N. Hamilton**, Australian Commissioner, Fiji, as Australian Alternate Commissioner on the SPC.

● A visit by **Mr. Arthur Osteen,** Executive Director, Africa-Asia Programme, Syracuse University, U.S.A.

## HEALTH

The main activities of the programme were continued in the fields of—

Public Health (urban and rural)
Health Education
Maternal and Child Health
Nutrition
Training
Epidemiology
Research
Health Information.

Research work continued on fish toxicity, eosinophilic meningitis, and solar-stills, in collaboration with other institutions in the area as well as the University of Hawaii and the National Institutes of Health of the United States. Dissemination of health information generally and material on health education subjects was maintained. Special courses were conducted, especially in the Gilbert and Ellice Islands Colony, Wallis Island, the Cook Islands, and Western Samoa.

JANUARY

Health Education Officer, **Mme. de Hollanda**, conducted a health education course for teachers in the New Hebrides.

A multi-discipline course for teachers, nurses, and other personnel concerned with community work, was conducted on Wallis Island as a pilot project at the Mua School, by Health Education Officer, **Miss Geisseler.**

A WHO seminar at Manila on methods to improve nutritional standards at the village level was attended by Mme. de Hollanda.

A paper entitled *Zoonotic Importance on the Parasites of Small Animals* was presented to the New Zealand Veterinary Association Conference, by Medical Officer, **Dr. R. A. Chappel.** The latter also attended the ANZAAS Conference in Canberra as SPC observer.

FEBRUARY

Following her return from the WHO Seminar at Manila, Mme. de Hollanda began a tour via Fiji to the Gilbert and Ellice Islands, for field work extending to ten weeks.

Co-operation was extended to the WHO-sponsored survey of the health and genetic structure of Tongariki in the New Hebrides, by making available the services of Dr. Chappel for a special assignment, in which he conducted medical examinations of a large proportion of the total population, and an examination of animals in order to assess the diseases communicable to humans.

Preliminary work on the six-months' health statistical survey authorized by the Commission at its Twenty-fifth Session commenced with the arrival of the Medical Statistician, **Mr. C. E. Gardiner.**

MARCH

The Secretary-General, **W. D. Forsyth**, visited the WHO Regional Office for the Western Pacific, Manila.

Courses in health education in the Gilbert and Ellice Islands Colony were continued by Health Education Officer, Mme. de Hollanda.

Following completion of medical field work in connexion with the WHO-sponsored survey on Tongariki Island in the New Hebrides, Medical Officer, Dr. Chappel, returned to headquarters.

The production of a nutrition handbook by **Dr. C. Jardin** commenced. Dr. Jardin had just completed an FAO assignment on school nutrition in French Polynesia. Work on the handbook has been facilitated through the co-operation of the Government of New Caledonia.

Medical Statistician, Mr. C. E. Gardiner, arrived at headquarters to begin a medical statistical survey that will embrace some thirteen territories within the SPC area.

Health education courses were begun in the Cook Islands by Health Education Officer, Miss Geisseler.

Visit by **Dr. B. Adan**, WHO sanitary engineer, for discussions and demonstrations of sanitation techniques.

Official visit by the Executive Officer, **Dr. Loison**, to the British Solomon Islands via New Hebrides, to discuss medical problems (including the first discovery of *angiostrongylus cantonensis* in rats in Honiara.)

Visits to New Hebrides and British Solomon Islands by Dr. Jardin to observe nutrition conditions.

## ECONOMIC DEVELOPMENT

The main activities of the programme were continued in the fields of—

- Plant Production Improvement
- Animal Production Improvement
  - —Fisheries
  - —Animal Husbandry
- Plant and Animal Protection
- Economic Affairs
- Training
  - —Boat Building
  - —Agricultural Extension
  - —Business and Elementary Economics

JANUARY

The Project Manager of the UN/SPC Rhinoceros Beetle Project, **Dr. C. P. Hoyt**, was appointed on 1st January. After preparatory work at Commission headquarters, Dr. Hoyt left for Apia to establish the project headquarters.

An FAO Seminar on Fisheries Development Planning and Administration, in Canberra, Australia, was attended by Fisheries Officer, **M. Louis Devambez**, as observer.

The Boat Building Training Courses, at Auki and Nouville, resumed after a brief Christmas and New Year holiday break.

The Executive Officer and Section staff were occupied mainly with preparatory activities for the conferences and meetings with which the Section is connected during 1964.

A scheme initiated by SPC was implemented, in association with IFO and TTPI, to introduce a parasitic wasp of the genus Tetrastichus into New Caledonia in an attempt to control Brontispa, a serious pest of the coconut palm. Some parasites were introduced also into French Polynesia.

The services were made available to Malaysia of the Tropical Agriculturist, **Mr. K. Newton**, for the purpose of studying and reporting upon cocoa and the future prospects for the crop. Mr Newton took up duty at SPC Headquarters on 6th February.

FEBRUARY

FAO Fishing Boat Specialist, Bangkok, **Mr. Jan Olaf Traung**, visited headquarters for discussions. He inspected local boat building establishments and the UN/SPC Boat Building Course at Nouville.

The appointment of the Rhinoceros Beetle Project Control Board was announced. The Executive Officer and Tropical Agriculturist both left for Apia in connexion with the preliminary administrative details of the project as a whole and to attend the first meeting of the Control Board.

With collaboration from the SPC, a multi-purpose team of four experts from IFO proceeded to Vila to investigate lower yields of coconut and copra, the yearly yields of coconut palms, and the early fall of young coconuts.

**Mr. R. Straatman,** Entomologist, Bernice P. Bishop Museum, Honolulu, left headquarters where he had been based for three months while doing field work in New Caledonia.

Visit by **Mr. Pennington**, Botanist, Commonwealth Forestry Institute, England, who collected material and data on flowering plants of the *Meliaceae* family.

MARCH

A sandalwood species expert, **Dr. Stauffer**, of the University of Zurich, was based at headquarters during field work in New Caledonia seeking additional collections.

The second regional SPC Plant Quarantine Conference opened at Apia, Western Samoa. A preliminary report of the Conference appears elsewhere in this issue.

The inaugural meeting of the UN/SPC Rhinoceros Beetle Project was held at the beginning of March.

The Director of the Commonwealth Institute of Biological Control, Trinidad, visited headquarters and went on to Apia for discussion with the Executive Officer, Tropical Agriculturist, delegates, and others attending the Plant Quarantine Conference.

Collection of vegetative propagative materials of breadfruit clones continued in early March in the eastern area of the British Solomon Islands Protectorate.

Preliminary preparations were advanced for the Training Course on Incentives to Economic Development to be held at Rarotonga, Cook Islands, in April/May. The course will be under the direction of the Commission's Economist, assisted by its Co-operatives Specialist.

**Dr. K. H. Marschall**, Insect Pathologist, and **Dr. A. D. Hinckley**, Insect Ecologist, took up appointments in Apia with the UN/SPC Rhinoceros Beetle Project.

## SOCIAL DEVELOPMENT

The main activities of the programme were continued in the fields of—

- Literature Promotion
- Territorial Library Development
- Education
  - —Assistance (study visits, specialists, seminars)
  - —Research centre, preparation of plans
  - —Language teaching
- Community Education and Self-help
- Co-operatives
- Promotion of Applied Research
  - —Urbanization
  - —Handicrafts
  - —Vital Statistics
- Social and Labour Problems
  - —Labour
  - —Housing
- South Pacific Games
- Social Development Clearing-house

Preliminary work was done on meetings to be held this year in the Social Development field, including the Technical Meeting on Urban Local Government and the Regional Education Seminar, and further work on the development of the Community Education Training Centre, Suva, Fiji.

JANUARY

Following a short Christmas and New Year break, the Training Course in Home Economics for Community Work resumed at the Community Education Training Centre, Suva.

After attending two seminars in Australia, during late January and early February, the Executive Officer for

Social Development, **Dr. Seddon**, visited Port Moresby to discuss arrangements for the forthcoming SPC Urban Local Government Technical Meeting.

The first of the two seminars attended by Dr. Seddon was directed to the rôle of schools and universities in adult education. The invitation to the SPC to participate was extended by the Australian National Advisory Committee for UNESCO.

The handicrafts survey, authorized at the Twenty-fourth Session, was completed with the coverage of the Loyalty Islands by Social Development Assistant, **Mr. A. McBean.**

**Professor R. T. Kennedy** and **Mr. J. R. Dart**, of the Town Planning Department, University of Auckland, with SPC assistance, carried out a town planning survey at Port Vila, New Hebrides.

FEBRUARY

An international seminar on community development, the second of the two seminars attended by the Executive Officer, was conducted at the University of New England, Australia.

By arrangements made through the SPC, **Mlle. M. Brue**, of New Caledonia, proceeded to Fiji for one month to attend the SPC Community Education Training Centre at Suva.

MARCH

FAO Home Economist, **Miss M. Crowley**, now attached to SPC and normally based at the Community Education Training Centre, Fiji, visited the New Hebrides and Nouméa. She proceeded to Tonga to conduct a course on the utilization of cyclone relief materials.

Consultations on urbanization problems and university research programmes were carried out by the Officer-in-Charge, Urbanization Research Information Centre, with universities in Australia and New Zealand.

The Language Teaching Specialist, **Mr. G. A. Pittman**, commenced duty in Sydney for a short period before proceeding on to headquarters.

A course on co-operative training was conducted in the New Hebrides by Co-operatives Specialist, **Mr. R. H. Boyan.**

## SECRETARIAT

The Secretary-General, **Mr. W. D. Forsyth**, paid official visits to the Trust Territory of the Pacific Islands and Guam. In the course of his travel to and from the Territories he had discussions at the WHO Regional Headquarters at Manila, UNTAB regional headquarters at Kuala Lumpur, and FAO and ECAFE headquarters at Bangkok.

Appropriate follow-up action continued on approvals in the various fields given at the Twenty-fifth Session of the Commission. Particular attention was given to the budgetary position for the present year as well as for the future, and to the administrative arrangements and inauguration of the UN/SPC Rhinoceros Beetle Project.

The Auditors made their annual review of the Commission's accounts.

Publications during the period were the January issue of the quarterly SOUTH PACIFIC BULLETIN and the monthly news-sheet SOUTH PACIFIC NEWS, each in both French and English.

Recorded radio talks for distribution to broadcasting stations within the area were continued on a monthly basis. Talks were given respectively by Economist, **Mr. R. C. White**, Executive Officer for Health, **Dr. Guy Loison**, and Fisheries Officer, **M. Louis Devambez.**

Several staff changes occurred in the period. The new Chief Interpreter/Translator, **M. Guy Dalebroux**, took up duty, also the Tropical Agriculturist, **Mr. K. A. Newton**, the short-term Consultant on Medical Statistics, **Mr. C. E. Gardiner**, and the Language Teaching Specialist, **Mr. G. A. Pittman.** The new Finance Officer, **Mr. F. C. Thorburn**, took up duty prior to the departure of **Mr. A. J. Neil.** The Chief, Services and Maintenance, of many years' standing, **Mr. R. W. M. Webb**, left the Commission Service to take up a managerial appointment in Nouméa.

## PLANT QUARANTINE CONFERENCE

Immediately following the meeting of the *Rhinoceros Beetle Operations Board*, in Apia, the SPC *Regional Plant Quarantine Conference* was held from 10th to 19th March, and was attended by representatives from almost all the territories in the South Pacific Commission's area.

This Conference studied in detail every possible way and means of achieving better crop protection in the area through the implementation of more efficient plant quarantine measures.

Under the chairmanship of Mr. B. A. O'Connor, Senior Entomologist of the Fiji Department of Agriculture, the Conference paid particular attention to the training of territorial plant quarantine personnel and interterritorial co-operation in the use of plant quarantine facilities. It is hoped that the practical realization of the discussions will soon take place in both of these fields as a result of the Conference's recommendations.

A full account will be given in the next issue of the SOUTH PACIFIC BULLETIN.

**Participants to the Conference, centre—the Honourable Asiata Lagolago, Minister of Agriculture, Western Samoa.**

# Rhinoceros Beetle Operations Board

*In March, under the auspices of the South Pacific Commission, an important meeting was held in Apia, Western Samoa. It was concerned with more efficient crop protection in the Commission's area.*

FROM 3rd to 7th March, under the chairmanship of Dr. K. A. Ryerson, Dean Emeritus of the College of Agriculture, University of California, the first meeting was held of the SPC *Rhinoceros Beetle Operations Board*. This board was recently set up to assist in the technical direction of the five-year *UNSF/SPC Rhinoceros Beetle Project*. Members of the board include representatives of the six participating governments—Messrs. A. W. Charles (Australia), R. Millaud (France), B. A. O'Connor (United Kingdom), B. E. V. Parham (Western Samoa), K. A. Ryerson (United States), and J. B. Wright (New Zealand), a representative of the South Pacific Commission, Dr. J. Barrau, and the Project Manager, Dr. C. P. Hoyt.

Mr. B. B. Given, Senior Principal Scientific Officer (Biological Control) of the New Zealand Department of Scientific and Industrial Research, and Mr. M. Watt, Entomologist of the Department of Agriculture, Western Samoa, attended the meeting as advisers nominated by their respective governments.

Also attending the meeting were Mr. K. Newton, SPC Tropical Agriculturist, who is the Project's SPC Liaison Officer Designate, and Mr. A. J. Neil, SPC Finance Officer.

During the four days of its discussions, the board prepared a General Works Programme for the five-year project and a Detailed Work Programme for the first twelve months of its operation.

The board outlined the organization and staffing of the project, which will carry out the greater part of its operations in the South Pacific area. The headquarters of the project will be in Western Samoa, with a base in South-East Asia, probably in Malaysia, and another in Africa, from where work will take place mainly in West Africa and Madagascar.

Provision has been made for a scientific staff including, in addition to the Project Manager, three entomologists, two insect ecologists, and two insect pathologists.

Part of the research work will be undertaken by specialized research institutions outside the South Pacific area under a system of contracts.

The Rhinoceros Beetle Operations Board

## PACIFIC PORT TOWNS AND CITIES

*[A symposium. Edited by Alexander Spoehr. Bishop Museum Press, 1963. 89 pp. $3.50.]*

For those interested in the study of urbanization problems in the South Pacific region, this book, published by the Bishop Museum Press, with financial assistance from the U.S.A. National Science Foundation, constitutes a welcome addition to knowledge of the problems in the major urban centres in the region. The book, with its short foreword by Dr. Spoehr, contains nine papers presented by anthropologists at the Symposium on "Pacific port towns and cities" of the Tenth Pacific Science Congress, held in August, 1961, in Honolulu.

Until comparatively recently, anthropological and geographical field-workers have been more interested in the traditional rural communities than in urban societies. This book is dedicated to the memory of Professor Felix M. Keesing, who was to have convened the symposium and who died a few months before the Congress. He had a long-standing interest in urbanization in the South Pacific and felt that its study had been neglected by anthropologists working in the region.

The volume contains papers on Medan (Indonesia) and Dumagete City (Philippines) and a series of seven papers, based on recent field work by Guiart, Nayacakalou, Oliver, Kay, Jullien, and Moench on island port towns (including Nouméa, Suva, and Papeete). There is also an interesting theoretical consideration by Cyril Belshaw of factors affecting their growth.

Immediately following the Tenth Pacific Science Congress, the South Pacific Commission convened a meeting of the Commission's Urbanization Advisory Committee in Honolulu to focus attention on some of the more urgent problems of urbanization in the South Pacific. The Committee's recommendations led to the establishment in 1962 of the South Pacific Commission's Urbanization Research Information Centre, two of its main functions being the provision of clearing-house services and the promotion of research in the field of urbanization in the South Pacific Commission region.

## SOLAR HOUSE EXPERIMENT

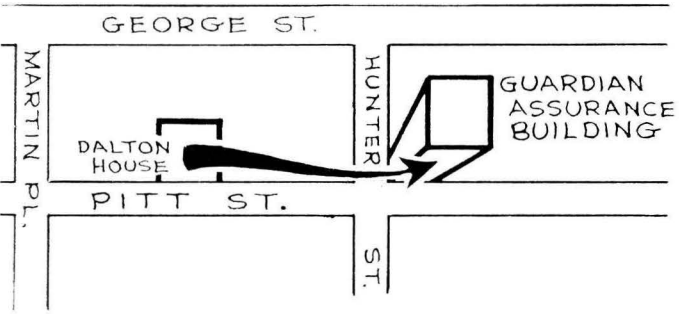
Scientists from the University of Queensland, Australia, have successfully experimented with a solar house, one-third normal size, which provides hot water, refrigeration, air-conditioning, and cooking facilities. Further research is now to be made with a family living inside a similar but full-sized house. The result of the experiment will be watched with interest in the Pacific.

# PACIFIC READING

*Material in this section is contributed by the South Pacific Commission Publications Bureau. Any inquiries relating thereto should be directed to* Box 5254, G.P.O., Sydney, Australia.

## Notes and News

BUREAU'S NEW ADDRESS The S.P.C. Publications Bureau has now moved from its former location in Dalton House to new offices on the 9th floor, Guardian Assurance Building, 34 Hunter Street, Sydney. The telephone numbers are 28 2791, 28 2792, and all correspondence should be addressed to—Box 5254, G.P.O., Sydney, N.S.W., Australia.




In addition to continuing the previous Literature Bureau activities of assistance to territories, particularly in respect of Literature Promotion and technical advisory services, the new unit will also be responsible for the production of all official Commission publications.

As in the past, we are always glad to see visitors from the islands, and a cordial invitation is extended to all to visit the Bureau when in Sydney.

STAFF Mr. Ben C. Goffman recently joined the editorial staff of the Publications Bureau in Sydney. Mr. Goffman has had wide experience as a journalist and photographer and, prior to joining the Commission staff, was Publications Officer with the Commonwealth Experimental Building Station, a division of the C.S.I.R.O.

### Bureau Publications

HANDICRAFTS OF THE SOUTH PACIFIC Now being prepared for early publication by the S.P.C. Publications Bureau, this 64-page booklet is a comprehensive guide to the native arts and crafts currently available in the territories within the Commission area. The text has been written by Mr. Angus McBean, and is based on the results of a survey undertaken by the author at the request of the territories involved. These include—American Samoa, British Solomon Islands, Fiji, French Polynesia, Gilbert & Ellice Islands, New Caledonia, New Hebrides, Niue, Pitcairn, Tokelau Islands, Tonga, Trust Territory of the Pacific Islands, and Wallis and Futuna.

The brochure commences with an introduction to the peoples of the South Pacific, their products, and their techniques; and within the introduction there are contained fascinating glimpses into the lives of the islanders. Each territory is prefaced with a detailed description of the general products together with a brief outline of its history and social and economic development. Under each product heading, an attempt is made to provide the reader or buyer with the necessary pertinent information—a most difficult task in many ways because the very nature of artistic production precludes an exact detailing of features. Furthermore, native craftsmen seldom exactly duplicate their method of production in illustrating an artifact or piece of handiwork. The buyer is warned, and must therefore be prepared to accept, within reasonable limits, products which might occasionally bear physical differences from samples which have been previously purchased.

It follows, too, that the prices might also vary from time to time, and from place to place—artistic temperament itself may, for various reasons, dictate a change in price. For this reason, a price range has also been included which should serve buyers well when ordering from the addresses given at the end of each chapter.

Attractively produced with a 4-colour cover and amply illustrated (17 in colour and 38 in black-and-white), the brochure will certainly be of more than considerable interest to anyone interested in the subject of native handicrafts. Although intended mainly as a guide for prospective buyers and importers of handicrafts, the general reader will also find much of interest in this unusual publication.

All inquiries in connexion with the purchase of this brochure should be addressed to the South Pacific Commission, Publications Bureau, Box 5254, G.P.O., Sydney. Price—A.5/- per copy.

## Reprint—Bureau Publications

In response to requests, the Bureau has arranged the reprinting of the following previously out-of-stock health leaflets—

Tina Protects Her Family; Clean Milk; Milk for Rauna
(£A1/1/6 per 100 copies)

Clean Water; Fruit Juice for Baby
(£A1/9/- per 100 copies)

Infant & Maternal Welfare Clinics
(£A1/1/6 per 100 copies)

Copies of these leaflets are now available from the S.P.C. Publications Bureau, Box 5254, G.P.O., Sydney, at the prices indicated.

## Visual Aids

A series of fourteen 16 mm. films dealing with various aspects of native life and activities in the Ellice Islands was recently donated to the Commission's Film Library by the Federal Republic of Germany. Produced during 1960/61 by Dr. G. Koch, a noted German anthropologist, under the auspices of the German Research Association, these excellent documentary films provide a valuable and permanent record of such traditional activities as—boatbuilding, house construction, rope-making, fishing, dancing and competitions, and games.

All films are silent, with German sub-titles, but a small booklet (in German), illustrated with sketches and diagrams and containing additional information, is supplied.

The films are—

*Polynesien-Niutao (Ellice-Inseln)* (Polynesia-Ellice Islands)

No. E408/1961 Bau eines groben Auslegerbootes. Pt. 1 and 2. (The construction of a large outrigger boat)

No. E409/1961 Bau eines Schlafhaus. Pt. 1 and 2. (Construction of dormitory sleeping house)

No. E410/1961 Bau einer Erdofenhutte. (Construction of an earth store hut)

No. E411/1961 Herstellen von Kokosfaserschnur. (Fabrication of a rope of coconut fibre)

No. E412/1961 Fischfang auf hoher See (Bonitofang). (Deep-sea fishing—Catching of Bonito fish)

No. E413/1961 Arbeiten in einer Pflanzungsgrube. (Working in a planting hole to grow Pulaka bulbs)

No. E414/1961 Zubereiten von pulaka-Knollen (taufangongo-Verfahren). (Preparing of Pulaka for meals)

No. E415/1961 Fakanau-Tänze. (Fakanau dances)

No. E416/1961 Fatele-Tänze. (Fatele dances)

No. E417/1961 Siva-Tänz. (Siva dances)

No. E418/1961 Viiki-Tänz. (Viiki dances)

No. E420/1961 Wettkämpfe und Spiele. (Competitions and games)

These films have now been added to the Commission's film collection held by the National Library of Australia; metropolitan or territorial government departments interested in viewing these films can obtain them on free loan, in accordance with the conditions outlined in the Commission's Film and Filmstrip Catalogue, Technical Paper No. 112.

## Books for the Pacific

TEACHING STRUCTURAL ENGLISH G. Pittman, Brisbane: Jacaranda Press. 1964. 216 pp. A.30/-.

Reviewed at the galley-proof stage, in *Notes and News* for April, 1962, this book has now been published by Jacaranda Press. The author, Mr. G. Pittman, formerly Director of the Language Institute, University of Wellington, N.Z., recently accepted an appointment with the South Pacific Commission as Language Teaching Specialist.

As mentioned in our earlier review, this book is a detailed account of just what is meant by the structural approach to language teaching. The first half of the book contains a detailed exposition of the matter, and indicates the rôle and importance of structural words in language teaching; there is then a short section on the implication of this for the language syllabus; and finally there is a long section of teaching methods when a structural approach is adopted.

It is considered this book should be of great value to those who have had considerable experience of teaching English as a second language but who, for one reason or another, have not had the time or the opportunity to examine very closely what is meant by and involved in the structural approach. Available from booksellers.

A STUDY OF UNDERSTANDING OF VISUAL SYMBOLS IN KENYA Alan C. Holmes. Overseas Visual Aids Centre, London, 1963. (Publication No. 10.) 32 pp. Illust. Stg.5/-.

While engaged in field work in teaching "health" to those in Kenya in need of such information, it occurred to the author to devise the tests described in his booklet as a means of evaluating the impact of pictorial symbols when presented outside his own cultural context.

This enterprise entailed lengthy correspondence and frequent misunderstandings, but it is to Mr. Holmes' credit that he remained sufficiently undaunted to present his conclusions from an analysis based on approximately 1,500 replies to a pair of pictorial questionnaires.

The booklet contains a number of hypotheses which are first subjected to test, next to subsequent analysis, and concluded with a following comment. It is to be commended for the stimulation it will provide to fellow workers in allied fields to extend and develop the techniques so described.

All inquiries concerning the booklet should be addressed to—The Director, O.V.A.C., 31 Tavistock Square, London, W.C.1, England.

LET US SPEAK MAORI Father Floribert van Lier, ss.,cc. 54 pp. Illust. Stg.10/-.

With the contents of this book as a foundation, the student of the Maori language is able to grasp a clear picture of the language as a whole, complete with an extensive vocabulary. Its aim is to foster the "spoken language" and to this end the instructional material is kept to a minimum, the emphasis being placed on learning the most relevant phrases and sentence constructions.

Copies are available from the Catholic Mission, Rarotonga, Cook Islands.

*THE SOUTH PACIFIC BULLETIN, first published in January, 1951, features articles on selected activities in the Commission's three main fields of operation: economic development, health, and social development. Articles are also contributed by specialists working in these and related fields, in the territories within the Commission area.*

***THE BULLETIN is given selective world distribution to people and institutions in widely differing fields sharing a common interest in the purposes and work of the Commission. It is published in two editions, English and French.***

*ALL INQUIRIES relating to the SOUTH PACIFIC BULLETIN should be directed to: The Editor, South Pacific Commission Publications Bureau, G.P.O. Box 5254, Sydney, Australia.*



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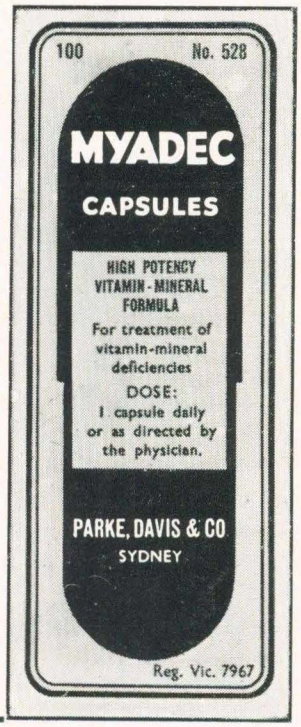


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